Genie Nano Series™

Camera User's Manual

Monochrome & Color GigE Vision Area Scan

sensors | **cameras** | frame grabbers | processors | software | vision solutions

Genie Nano™

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Notice

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About Teledyne DALSA
Teledyne DALSA is an international high performance semiconductor and electronics company that designs, develops, manufactures, and markets digital imaging products and solutions, in addition to providing wafer foundry services.

Teledyne DALSA Digital Imaging offers the widest range of machine vision components in the world. From industry-leading image sensors through powerful and sophisticated cameras, frame grabbers, vision processors and software to easy-to-use vision appliances and custom vision modules.

Contents

Genie Nano Series Overview

Description

The Genie Nano series, a member of the Genie camera family, provides a new series of affordable easy to use digital cameras specifically engineered for industrial imaging applications requiring improved network integration.

Genie Nano cameras use the industries' latest leading sensors such as the Sony Pregius series of global shutter active pixel-type CMOS image sensors.

Genie Nano cameras combine standard gigabit Ethernet technology (supporting GigE Vision 1.2) with the Teledyne DALSA Trigger-to-Image-Reliability framework to dependably capture and transfer images from the camera to the host PC. Genie Nano cameras are available in a number of models implementing different sensors, image resolutions, and feature sets, either in monochrome or color versions.

GigE with TurboDrive

Genie Nano cameras include TurboDrive™ technology, delivering high speed data transfers exceeding the GigE limit. TurboDrive uses advanced data modeling to boost data transfers up to 2 or 3 times faster than standard GigE Vision speeds – with no loss of image quality. These breakthrough rates are achieved using a proprietary, patent pending process that assembles data from the sensor to optimize throughput, simultaneously taking full advantage of both the sensor's maximum frame rate and the camera's maximum GigE data transfer speed (up to 110 Mbytes/s). Teledyne DALSA's TurboDrive increases system dependability and robustness similar to Camera Link throughput on a GigE network.

Important: Actual Transfers with TurboDrive is Image content dependent but in the best case scenario, transfers over a GigE Network can reach the camera's internal acquisition limit of 84fps. If transfers are less than the camera maximum frame rate, camera memory will be used as a circular frame buffer. Refer to TurboDrive Primer on the Teledyne DALSA web site for more detail.

Genie Nano Overview

- Optimized, rugged design with a wider operating temperature
- Available in multiple resolutions, monochrome and color
- Higher frame rates with Teledyne DALSA GigE Vision TurboDrive Technology
- Visual camera multicolor status LED on back plate
- Multi-ROI support
- 2 general purpose inputs
- 2 general purpose outputs
- Supports both Power Over Ethernet (PoE) and auxiliary power input
- Counter, Timer, and Events available to support imaging applications
- 1µs internal timer can timestamp images
- Variety of internal test image patterns for quick camera verification
- 2 User Settings sets to store and recall camera configurations
- Supports the Gigabit Ethernet PAUSE Frame feature
- GigE Vision 1.2 compliant
- Gigabit Ethernet (GigE) interconnection to a computer via standard CAT5e or CAT6 cables
- Gigabit Ethernet (GigE) transfer speed up to 115 MB/second
- Application development with the freely available Sapera™ LT software libraries
- Native Teledyne DALSA Trigger-to-Image Reliability design framework
- Refer to the Operation Reference and Technical Specifications section of the manual for full details

GigE Firmware

Firmware updates for Genie Nano are available for download from the Teledyne DALSA web site www.teledynedalsa.com/imaging/support/downloads. Choose Genie Nano Firmware from the available download sections, then choose the zip file download specific to your camera model. When using Sapera LT, update the camera firmware using CamExpert (see File Access via the CamExpert Tool).

Part Numbers and Software Requirements

This manual covers the Genie Nano monochrome and color models summarized below. This table groups models by color mode, resolution, and other physical parameters. New models area added to this manual as they are released by Teledyne DALSA. See Genie Nano Common Specifications for details of each Genie Nano model.

Monochrome Cameras

Model Resolution	Sensor Model	Lens	Part Number
M1940 1936 x 1216	Sony IMX174	C-mount	G3-GM10-M1940
		CS-mount	coming soon
M1920 1936 x 1216	Sony IMX249	C-mount	G3-GM11-M1920
		CS-mount	coming soon

Color Cameras

Model Resolution	Sensor Model	Lens	Part Number	Notes
C1940 1936 x 1216	Sony IMX174	C-mount	G3-GC10-C1940	
			TBA	with IR Filter
		CS-mount	coming soon	
			TBA	with IR Filter
C1920 1936 x 1216	Sony IMX249	C-mount	G3-GC11-C1920	
			TBA	with IR Filter
		CS-mount	coming soon	
			TBA	with IR Filter

Accessories

Nano Accessories & Cables (sold separately)	Order Number
Mounting Bracket Plate, with 1/4 inch screw mount (tripod mount)	G3-AMNT-BRA00
I/O Blunt End Cable (2 meter Screw Retention to Flying Leads)	G3-AIOC-BLUNT2M
I/O Breakout Cable (2 meter Screw Retention to Euroblock connector)	G3-AIOC-BRKOUT2M
Power and Cable Evaluation Kit Includes a Power Supply (12V), an Ethernet Cable (RJ-45, 2 meter), and an I/O Breakout Cable (2 meter to Euroblock connector).	G3-ACBL-EVALKIT

Windows Development Software

Teledyne DALSA Software Platform for Microsoft Windows	
Sapera LT version 8.01 or later (for Windows) includes Sapera Network Imaging Package and GigE Vision Imaging Driver, Sapera Runtime and CamExpert. Provides everything you will need to develop imaging applications Sapera documentation in compiled HTML help, and Adobe Acrobat® (PDF)	Available for download http://www.teledynedalsa.com/imaging/support/
Sapera Processing Imaging Development Library (available for Windows or Linux - sold separately):	Contact Teledyne DALSA Sales
Teledyne DALSA Software Platform for Linux	
GigE-V Framework (for both X86 or Arm type processor)	Contact Teledyne DALSA Sales

Third Party GigE Vision Development

Third Party GigE Vision Software Platform Requirements	
Support of GenICam GenApi version 2.3	General acquisition and control
Support of GenICam GenApi version 2.3	File access: firmware, configuration data, upload & download
Support of GenICam XML schema version 1.1	
GenICam™ support — XML camera description file	Embedded within Genie Nano

About GigE Vision

GiGE VISION®	Genie Nano cameras are 100% compliant with the GigE Vision 1.2 specification which defines the communication interface protocol used by any GigE Vision device. The device description and capabilities are contained in an XML file. For more information see: http://www.machinevisiononline.org/public/articles/index.cfm?cat=167
GENICAM	Genie Nano cameras implement a superset of the GenICam™ specification which defines device capabilities. This description takes the form of an XML device description file respecting the syntax defined by the GenApi module of the GenICam™ specification. For more information see www.genicam.org.

The Teledyne DALSA GigE Vision Module provides a license free development platform for Teledyne DALSA GigE hardware or Sapera vision applications. Additionally supported are Sapera GigE Vision applications for third party hardware with the purchase of a GigE Vision Module license, or the Sapera processing SDK with a valid license.

The GigE Vision Compliant XML device description file is embedded within Genie Nano firmware allowing GigE Vision Compliant applications access to Genie Nano capabilities and controls immediately after connection.

Genie Nano Common Specifications

Model and Sensor specific specifications follow the common specifications present here.

Camera Controls	
Synchronization Modes	Free running, External triggered, Software trigger through Ethernet
Exposure Modes	Programmable in increments of 1µs minimum (in µs) is model specific maximum is 16 seconds Pulse controlled via Trigger pulse width.
Trigger Inputs	Opto-isolated, 2.4V to 24V typical, 16mA min. Debounce range from 0 up to 255 µs Trigger Delay from 0 to 2,000,000 µs
Strobe Outputs	Output opto-isolated: Aligned to the start of exposure with a programmable delay, duration and polarity (using “start of exposure on output line source” feature)
Features	
Image Buffer	90 MB total on-board memory for acquisitions and packet resend buffering
Gain	In Sensor gain (model dependent) and Digital gain up to 4x
Counter and Timer	1 Counter, and 1 Timer. User programmable, acquisition independent, with event generation.
Timestamp	1µs internal timer to timestamp images and events
Test image	Internal generator with choice of static and shifting patterns
User settings	Select factory default or either of two user saved camera configurations
TurboDrive Technology	Currently supported when using 8-bit pixel format (Sapera 8.01 or later)
Back Focal Distance	
C-mount models	17.52 mm
CS-mount models	12.52 mm
Mechanical Interface	
Camera (L x H x W) see Mechanical Specifications	21.2 mm x 29 mm x 44 mm (without lens mount or connectors) 38.9 mm x 29 mm x 44 mm (with C-mount and connectors)
Mass	46g (C-mount with no lens)
Power connector	via 10-pin connector, or RJ45 in PoE mode
Ethernet connector	RJ45
Electrical Interface	
Input Voltage	+10 to +36 Volts DC (+10%/- 10%) +9 to +56 Volts DC (Absolute min/max Range) on Auxiliary connector Supports the Power Over Ethernet standard. (PoE Class 3 as per IEEE 802.3af)
Power Dissipation (typical)	< 3.6W (12V), 4.1W (POE)
Ethernet Speed	Gigabit Ethernet 1000Mbps (10/100Mbps are not supported)
Ethernet Option supported	PAUSE Frame support (as per IEEE 802.3x)
Data and Control	GigE Vision 1.2 compliant
Environmental Conditions	
Operating Temperature	-20°C to +60°C (Housing Temperature)
Operating Relative Humidity	10% to 70% non-condensing
Storage	-40°C to +80°C temperature at 20% to 80% non-condensing relative humidity

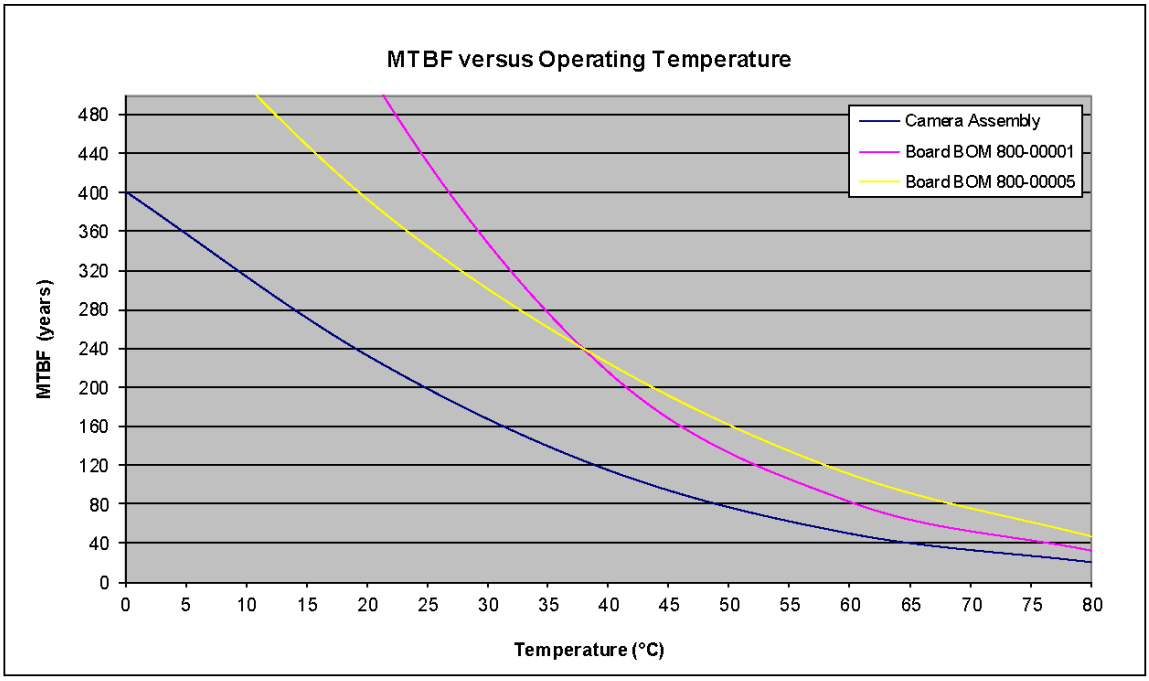
EMI, Shock and Vibration Certifications

Compliance Directives	Standards ID	Overview
CE	EN61000-4-2 : 2008	Electrostatic discharge immunity test
	EN61000-4-3 : 2006 A1 : 2007 A2 : 2010	Radiated, radio-frequency, electromagnetic field immunity test
	EN61000-4-4 : 2004	Electrical fast transient/burst immunity test
	EN61000-4-5 : 2005	Surge immunity
	EN61000-4-6 : 2008	Immunity to conducted disturbances, induced by radio-frequency fields
	EN61000-4-8 : 2009	Power frequency magnetic field immunity
	EN61000-4-11 : 2004	Voltage variations immunity
	EN61000-6-2 : 2005	Electromagnetic immunity
	EN61000-6-4: 2007	Electromagnetic emissions
	CISPR 11: 2009 A1 : group 1 FCC, part 15, subpart B:2010	Limit: class A Conducted Emissions
	CISPR 22 : 2008 Limit: class A	LAN port Conducted Emissions
FCC	Part 15, class A	
RoHS	Compliancy as per European directive 2011/65/EC	
For an image of Genie Nano certificates see "EC & FCC Declarations of Conformity" on page 92		
Vibration & Shock Tests	**Test Levels (while operating)**	**Test Parameters**
Random vibrations	Level 1: 2 grms 60 min. Level 2: 4 grms 45 min. Level 3: 6 grms 30 min.	Frequency range: 5 to 2000 Hz Directions: X, Y, and Z axes
Shocks	Level 1: 20 g / 11 ms Level 2: 30 g / 11 ms Level 3: 40 g / 60 ms	Shape: half-sine Number: 3 shocks (+) and 3 shocks (-) Directions: ±X, ±Y, and ±Z axes
Additional information concerning test conditions and methodologies is available on request.		

Mean Time Between Failure (MTBF)

The analysis was carried out for operating temperatures varying from 0 to 80ºC, with the product steady state temperature determined as 20ºC. The following table presents the predicted MTBF and failure rate values.

	Camera Assembly		
Temperatures	MTBF (hours)	MTBF (years)	Failure Rate (Failure/10^6 hours)
0	3514728	401.2	0.284517
20	2040096	232.9	0.490173
40	1005703	114.8	0.994329
60	434538	49.6	2.301294
80	177030	20.2	5.648757



Performance: Models M/C1940 & M/C1920

The sensor description below provides a specification table and response graphics. The graph describes the sensor response to different wavelengths of light (excluding lens and light source characteristics).

Model Specifications

Supported Features	Camera Models			
	M1920	C1920	M1940	C1940
Minimum Frame Rate (internal acquisition)	0.06 fps		0.06 fps	
Maximum Frame Rate (full resolution – 1936x1216)	38.8 fps		83.9 fps (with TurboDrive)	
Maximum Frame Rate Output	System dependent on the GigE network (based on typical 115 MBs of image data)			
Pixel Data Formats	Monochrome 8-bit Monochrome 12-bit	Bayer 8-bit Bayer 12-bit	Monochrome 8-bit Monochrome 10-bit	Bayer 8-bit Bayer 10-bit
Sensor Exposure Time Minimum	1 line time + 13.73 us = 34.23 µs auto-adjusted to steps of 20.5 µs (3 line time with initial beta version 1.00)		1 line time + 13.73 us = 23.23 µs auto-adjusted to steps of 9.5 µs (3 line time with initial beta version 1.00)	
Horizontal Line Time	20.5 µs		9.5 µs	
Exposure Time Maximum	~16 sec			
End of Exposure to Start of Readout	22 lines (451.5µs)		22 lines (209.2µs)	
Readout Time	Horizontal Line Time (max) x (lines in full frame +20) — *in µs*			
Exposure Control	Internal - Programmable via the camera API External – based on Trigger Width			
Internal Trigger to Start of Exposure	2 to 3 line time			
External Exposure Control	(1 line time + 13.73 us)			
Gain Control	In-Sensor Gain: 48dB range up to 24dB as analog gain in 0.1 dB steps (1x to 15x) from 24dB to 48dB as digital gain in 0.1 dB steps (from 16x to 250x) Additional Digital Gain: 4x (monochrome models only, color models TBA)			
Black Offset Control	Yes (0 to 511 dn)			
Multi-ROI Support	TBA		Yes — In-Sensor	
Synchronization	Via External Trigger Signal Or Internal Trigger Free Run			
Data Output	Gigabit Ethernet (~115MB/sec max)			
Pixel Size	5.86 µm x 5.86 µm			
Shutter	Full frame electronic global shutter function			
Full Well charge	32 ke (max)			
Output Dynamic Range † ‡	75 dB (12-bit buffer), 68 dB (10-bit)			
Signal to Noise ratio †† ‡	30 dB typical			
DN Variation	50% saturation: < +/- 0.5%			
Responsivity	see graphic:			

† Dynamic Range Test Conditions

- Exposure 100µs
- 0% Full Light Level

†† SNR Test Conditions

- Exposure 2000µs
- 80% saturation

‡ Specifications calculated according to EMVA-1288 standard, using white LED light

Sensor Cosmetic Specifications

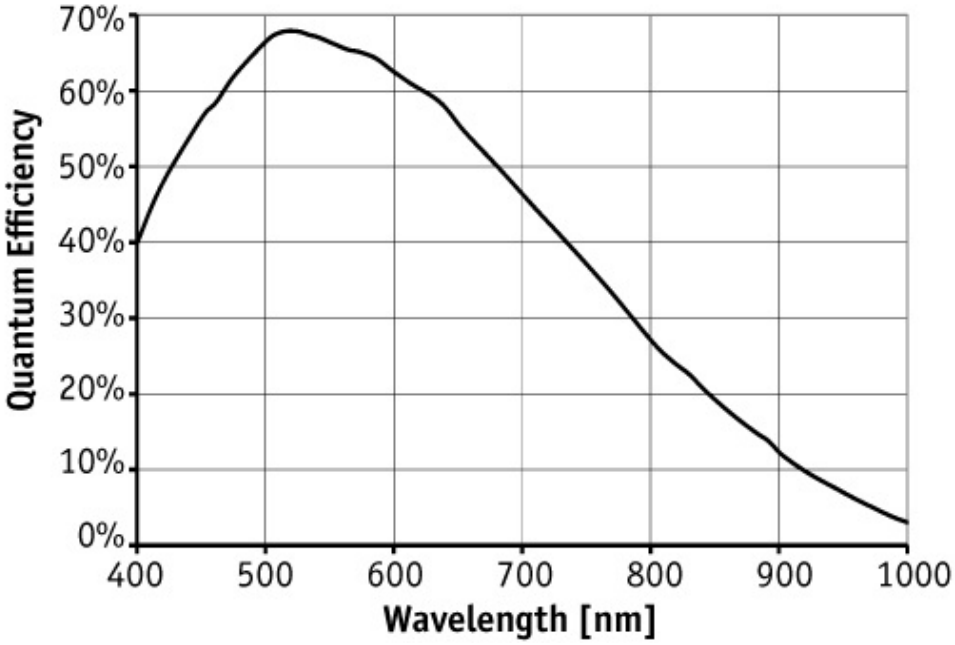
Blemish Specifications	Maximum Number of Defects	Blemish Description
Hot/Dead Pixel defects †††	Typical 0.0025% Max 0.005%	Any pixel that deviates by ±20% from the average of neighboring pixels at 50% saturation including pixel stuck at 0 and maximum saturated value.
Spot defects	none	Grouping of more than 8 pixel defects within a sub-area of 3x3 pixels, to a maximum spot size of 7x7 pixels.
Clusters defects	none	Grouping of more than 5 single pixel defects in a 3x3 kernel.
Column defects	none	Vertical grouping of more than 10 contiguous pixel defects along a single column.
Row defects	none	Horizontal grouping of more than 10 contiguous pixel defects along a single row.

††† Test conditions

- Nominal light = illumination at 50% of saturation
- Temperature of camera is 45°C

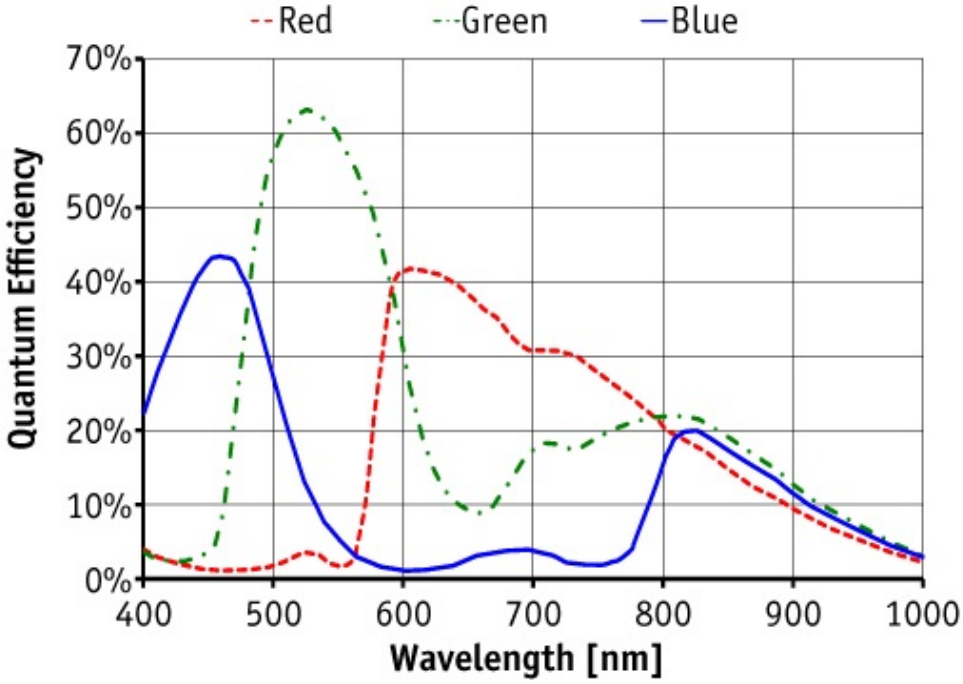
Spectral Response

Monochrome Models M194x & M192x, (Sony IMX174 & IMX249)



Measured Fill-Factor x Quantum Efficiency (FF x QE)

Color Models C194x & C192x, (Sony IMX174 & IMX249)



Measured Fill-Factor x Quantum Efficiency (FF x QE)

Nano Quick Start

If you are familiar with GigE Vision cameras follow these steps to quickly install and acquire images with Genie Nano and Sapera LT in a Windows OS system. If you are not familiar with Teledyne DALSA GigE Vision cameras go to Connecting the Genie Nano Camera.

- Your computer requires a second or unused Ethernet Gigabit network interface (NIC).
- Install Sapera 8.01 and make certain to select the installation of GigE Vision support.
- Connect Nano to the spare NIC and wait for the GigE Server Icon in the Windows tray to show that the Nano is connected. The Nano Status LED will be steady Blue.

If you have no lens on the Nano

- Start CamExpert. The Nano Status LED will be steady Green.
- Select the moving test pattern from the Image Format Feature Category.
- Click grab

If you have a lens on the Nano

- Start CamExpert. The Nano Status LED will be steady Green.
- Click the button to show a full camera image on CamExpert display.
- Click grab.
- Adjust the lens aperture and/or adjust the Nano Exposure as required.

Camera Works–Now What

Consult this manual for detailed Networking and Nano feature descriptions, as you write, debug, and optimize your imaging application.

Connecting the Genie Nano Camera

GigE Network Adapter Overview

Genie Nano connects to a computer's Gigabit Network Adapter. If the computer is already connected to a network, the computer requires a second network adapter, either onboard or an additional PCIe NIC adapter. Refer to the Teledyne DALSA Network Imaging manual for information on optimizing network adapters for GigE Vision cameras.

PAUSE Frame Support

The Genie Nano supports the Gigabit Ethernet PAUSE Frame feature as per IEEE 802.3x. PAUSE Frame is the Ethernet flow control mechanism to manage network traffic within an Ethernet switch when multiple cameras are simultaneously used. This requires that the flow control option in the NIC property settings and the Ethernet switch settings must be enabled. Refer to the Teledyne DALSA Network Imaging manual.

Connect the Genie Nano Camera

Connecting a Genie Nano to a network system is similar whether using the Teledyne DALSA Sapera LT package or a third party GigE Vision development package.

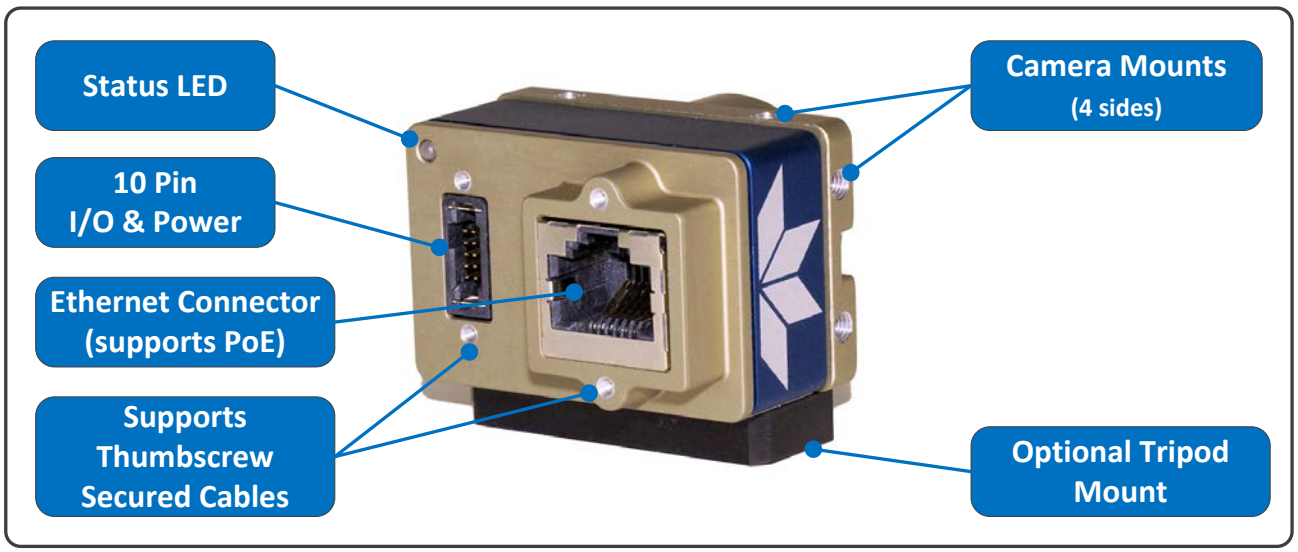
- Power supplies must meet the requirements defined in section Input Signals Electrical . Apply power to the camera.
- Connect Nano to the host computer GigE network adapter or to the Ethernet switch via a CAT5e or CAT6 Ethernet cable. **Note:** cable should not be less than 1 meter (3 feet) long or more than 100 meters (328 feet) long.
- Once communication with the host computer is started the automatic IP configuration sequence will assign an LLA IP address as described in section Genie Nano IP Configuration Sequence, or a DHCP IP address if a DHCP server is present on your network.
- Check the status LED which will be initially red then switch to flashing blue while waiting for IP configuration. See Camera Status LED for Nano LED display descriptions.
- The factory defaults for Nano is Persistent IP disabled and DHCP enabled with LLA always enabled as per the GigE Vision specification. For additional information see Nano IP Configuration Mode Details. See the next section Connectors for an overview of the Nano interfaces.

Connectors

The Nano has two connectors:

- A single **RJ45 Ethernet** connector for control and video data transmitted to/from the host computer Gigabit NIC. The Genie Nano also supports Power Over Ethernet (**PoE**). See Ruggedized RJ45 Ethernet Cables for secure cables.
- A **10 pin I/O** connector for camera power, plus trigger, strobe and general I/O signals. The connector supports a retention latch, while the Nano case supports thumbscrews. Teledyne DALSA provides optional cables (see Accessories). See 10-pin I/O Connector Details for connector pin out specifications.

The following figure of the Genie Nano back end shows connector and LED locations. See Mechanical Specifications for details on the connectors and camera mounting dimensions.



Genie Nano – Rear View

LED Indicators

The Genie Nano has one multicolor LED to provide a simple visible indication of camera state, as described below. The Nano Ethernet connector does not have indicator LEDs; the user should use the LED status on the Ethernet switch or computer NIC for networking status.

Camera Status LED Indicator

The camera is equipped with one LED to display its operational status. When more than one condition is active, the LED color indicates the condition with the highest priority (such as, an acquisition in progress has more priority than a valid IP address assignment).

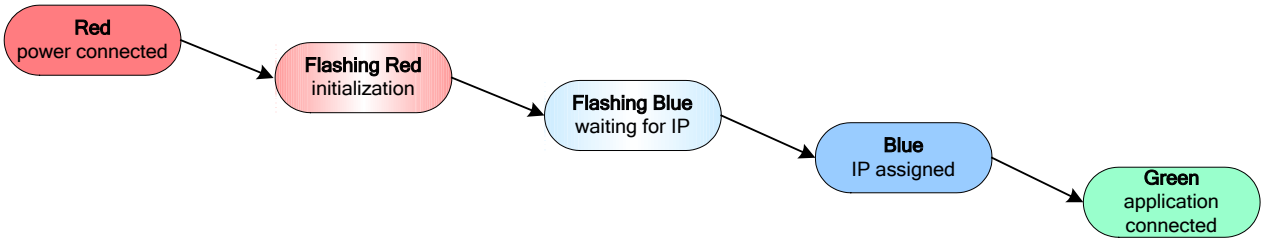
Once the Genie Nano connects to a network and an IP address is assigned, the Status LED will turn to steady blue. Only at this time will it be possible by the GigE Server or any application to communicate with the camera. The following table summarizes the LED states and corresponding camera status.

LED State	Definition
LED is off	No power to the camera
Steady Red	Initial state on power up before flashing. Remains as steady Red only if there is a fatal error. Camera is not initialized **
Flashing Red **	Initialization sequence in progress Wait less than a minute for the Nano to reboot itself.
Steady Red + Flashing Blue	Fatal Error. If the Genie Nano does not reboot itself contact Technical Support.
Slow Flashing Blue	Ethernet cable disconnected. The camera continuously attempts to assign itself an IP address.
Fast Flashing Blue	File Access Feature is transferring data such as a firmware update, etc.
Steady Blue	IP address assigned; no application connected to the camera
Steady Green	Application connected
Flashing Green	Acquisition in progress. Flashing occurs on frame acquisition but does not exceed a rate of 100ms for faster frame rates.

Note: Even if the Nano has obtained an IP address, it might be on a different subnet than the NIC it is attached to. Therefore, if the Nano LED is blue but an application cannot see it, this indicates a network configuration problem. Review troubleshooting suggestions in the Network Imaging manual.

LED States on Power Up

The following LED sequence occurs when the Genie Nano is powered up connected to a network.



Genie Nano IP Configuration Sequence

The Genie Nano IP (Internet Protocol) Configuration sequence to assign an IP address is executed automatically on camera power-up or when connected to a network. As a GigE Vision compliant device, Nano attempts to assign an IP address as follows.

For any GigE Vision device, the IP configuration protocol sequence is:

- Persistent IP (if enabled)
- DHCP (if a DHCP server is present such as the Teledyne DALSA Smart DHCP server)
- Link-Local Address (always enabled as default)

The factory defaults for Nano is Persistent IP disabled and DHCP enabled with LLA always enabled as per the GigE Vision specification. For additional information see Nano IP Configuration Mode Details.

Supported Network Configurations

The Genie Nano obtains an IP address using the Link Local Address (LLA) or DHCP, by default. If required, a persistent IP address can be assigned (refer to the Network Imaging manual).

Preferably, a DHCP server is present on the network, where the Genie Nano issues a DHCP request for an IP address. The DHCP server then provides the Nano an IP address. The **Teledyne DALSA Network Configuration tool**, installed with the Sapera Teledyne DALSA Network Imaging Package, provides a DHCP server which is easily enabled on the NIC used with the Genie Nano (refer to the Teledyne DALSA Network Imaging user's manual).

The LLA method, if used, automatically assigns the Nano with a randomly chosen address on the 169.254.xxx.xxx subnet. After an address is chosen, the link-local process sends an ARP query with that IP onto the network to see if it is already in use. If there is no response, the IP is assigned to the device, otherwise another IP is selected, and the ARP is repeated. Note that the LLA mode is unable to forward packets across routers.

Preventing Operational Faults due to ESD

Nano camera installations which do not protect against ESD (electrostatic discharge) may exhibit operational faults. Problems such as random packet loss, random camera resets, and random loss of Ethernet connections, may all be solved by proper ESD management.

The Nano camera when used with a simple power supply and Ethernet cable, is not properly connected to earth ground and therefore is susceptible to ESD caused problems. An Ethernet cable has no ground connection and a power supply's 0 volt return line is not necessarily connected to earth ground.

Teledyne DALSA has performed ESD testing on Nano cameras using an 8 kilovolt ESD generator without any indication of operational faults. The two following methods, either individually or together will prevent ESD problems.

- Method 1: Use a shielded/grounded power supply that connects ground to pin-10 of the I/O connector. The Nano case is now properly connected to earth ground and can withstand ESD of 8 kilovolts, as tested by Teledyne DALSA.
- Method 2: When using Power Over Ethernet (PoE), Teledyne DALSA strongly recommends using a shielded Ethernet cable to provide a ground connection from the controlling computer/power supply, to the Genie Nano. PoE requires a powered computer NIC, or a powered Ethernet switch, or an Ethernet power injector.
- Method 3: Mount the camera on a metallic platform with a good connection to earth ground.

Using Nano with Sapera API

A Genie Nano camera installation with the Teledyne DALSA Sapera API generally follows the sequence described below.

Network and Computer Overview

- Nano needs to connect to a computer with a **GigE network adapter**, either built in on the computer motherboard or installed as a third party PCI adapter. See the previous section Connecting the Genie Nano Camera.
- **Laptop computers** with built in **GigE network adapters** may still not be able to stream full frame rates from Nano, especially when on battery power.
- Nano also can connect through a **Gigabit Ethernet switch**. When using VLAN groups, the Nano and controlling computer must be in the same group (refer to the Teledyne DALSA Network Imaging Package user's manual).
- If Genie Nano is to be used in a **Sapera development environment**, Sapera LT 8.10 needs to be installed, which includes the **GigE Vision Module** software package with the Teledyne DALSA **GigE Vision TurboDrive Technology** module.
- If Genie Nano will be used in a **third party GigE Vision Compliant environment**, Sapera or Sapera runtime is not required and you need to follow the installation instructions of the third party package.
- The **Windows Firewall** exceptions feature is automatically configured to allow the Sapera GigE Server to pass through the firewall.
- Computers with **VPN software** (virtual private network) may need to have the VPN driver disabled in the NIC properties. This would be required only on the NIC used with the Nano. Testing by the user is required.
- Once a Nano is connected, look at the small camera icon added to the Windows tray (next to the clock). Ensure the Nano camera has been found (right click the icon and select Status) Note that in Windows 7, the icon remains hidden until a camera is connected.
- A new Nano installation may require a firmware update. The File Selector feature is used to select a firmware file. See the CamExpert procedure Updating Firmware via File Access in CamExpert for additional information.
- Use CamExpert (installed either with Sapera or Sapera runtime) to test the installation of the Nano camera. Set the Nano to internal test pattern. See Internal Test Pattern Generator.
- Set up the other components of the imaging system such as light sources, camera mounts, optics, encoders, trigger sources, etc. Test with CamExpert.

Installation

	**Note:** to install Sapera LT and the GigE Vision package, logon to the workstation as an administrator or with an account that has administrator privileges.

When Genie Nano is used in a **Sapera development environment**, **Sapera LT 8.01** needs to be installed, which automatically provides all GigE Vision camera support including TurboDrive.

If no Sapera development is required. then the Sapera LT SDK is not needed to control the Linea GigE camera. Sapera runtime with CamExpert provides everything to control the camera.

Procedure

- Download and install Sapera 8.01 which automatically provides GigE Vision support with Teledyne DALSA TurboDrive™ technology.
- Optional: If the Teledyne DALSA Sapera LT SDK package is not used, click to install the Genie Nano firmware and user manuals only. Follow the on screen prompts.
- Connect the camera to an available free Gigabit NIC.

Refer to Sapera LT User's Manual concerning application development with Sapera.

	**Note**: The Teledyne DALSA Sapera CamExpert tool (used throughout this manual to describe Genie Nano features) is installed with either the Sapera LT runtime or the Sapera LT development package.

Camera Firmware Updates

Under Windows, the user can upload new firmware, downloaded from Teledyne DALSA support, using the File Access Control features provided by the Sapera CamExpert tool.

Firmware via Linux or Third Party Tools

Consult your third party GigE Vision software package for file uploads to the connected device.

GigE Server Verification

After a successful Genie Nano Framework package installation, the GigE Server icon is visible in the desktop taskbar tray area (note that in Windows 7 the icon remains hidden until a camera is connected). After connecting a camera (see following section), allow a few seconds for the GigE Server status to update. The Nano camera must be on the same subnet as the NIC to be recognized by the GigE Server.

	Device Available	Device IP Error	Device Not Available
GigE Server Tray Icon:			
	The normal GigE server tray icon when the Genie device is found. It will take a few seconds for the GigE Server to refresh its state after the Genie has obtained an IP address.	The GigE server tray icon shows a warning when a device is connected but there is some type of IP error.	A red X will remain over the GigE server tray icon when the Genie device is not found. This indicates a major network issue. ***Or in the simplest case*,** the Genie is not connected.

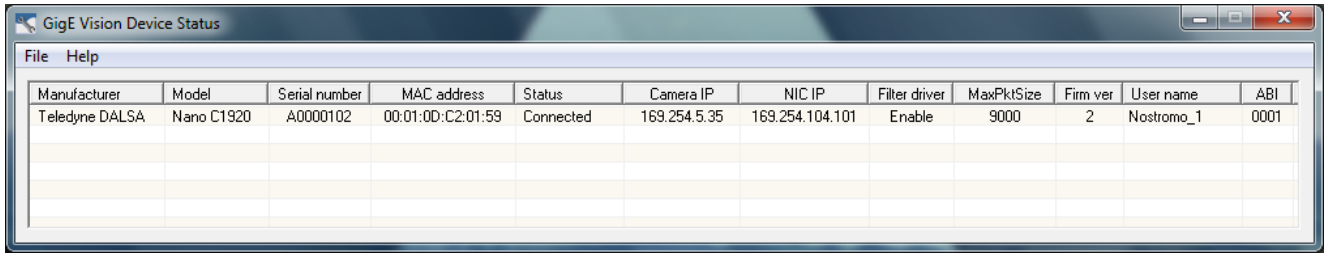
If you place your mouse cursor on this icon, the GigE Server will display the number of GigE Vision devices found by your PC. Right click the icon and select status to view information about those devices. See Troubleshooting for more information.

GigE Server Status

Once the Genie Nano is assigned an IP address (its Status LED is steady blue) the GigE server tray icon will not have a red X through it, indicating that the Nano device was found. It might take a few seconds for the GigE Server to refresh its state after the Nano has obtained an IP address.

Right-click the GigE Server tray icon to open the following menu.

Click on Show Status to open a window listing all devices connected to the host system. Each GigE device is listed by name along with important information such as the assigned IP address and device MAC address. The screen shot below shows a connected Nano with no networking problems.



In the event that the device is physically connected, but the Sapera GigE Server icon is indicating that the connected device is not recognized, click Scan Network to restart the discovery process. Note that the GigE server periodically scans the network automatically to refresh its state. See Troubleshooting for network problems.

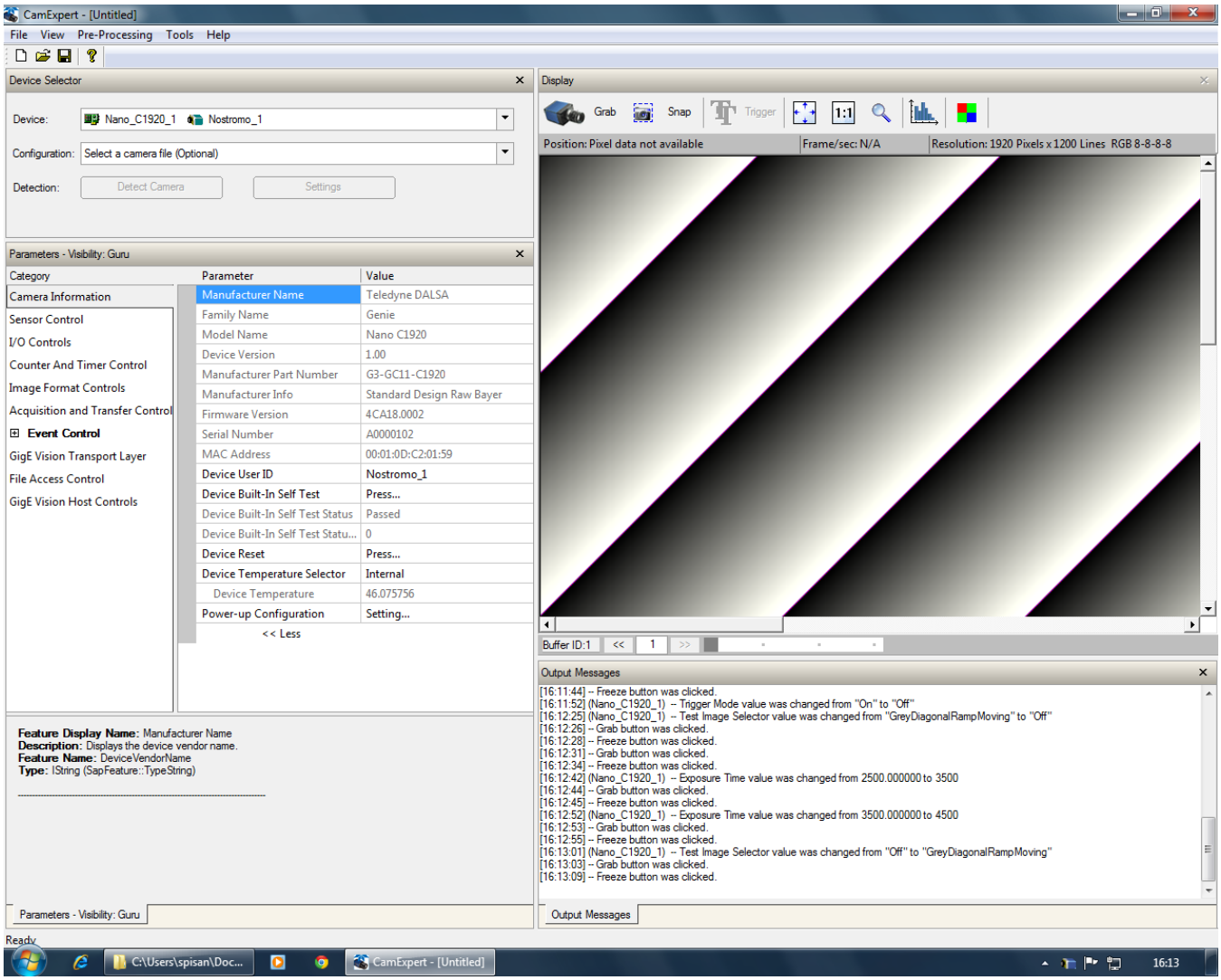
Optimizing the Network Adapter used with Nano

Most Gigabit network interface controllers (NIC) allow user modifications to parameters such as Adapter Buffers and Jumbo Frames. These should be optimized for use with the Nano during the installation. Refer to the **Teledyne DALSA Network Imaging package manual** for optimization information using the Network Configuration Tool.

Quick Test with CamExpert (Windows)

When the Genie Nano camera is connected to a Gigabit network adapter on a host computer, testing the installation with CamExpert is a straightforward procedure.

- Start Sapera CamExpert by double clicking the desktop icon created during the software installation.
- CamExpert will search for installed Sapera devices. In the Device list area on the left side, the connected Nano camera is shown or will be listed in a few seconds after CamExpert completes the automatic device search (device discovery).
- Select the Nano camera device by clicking on the camera user defined name. By default the Nano camera is identified by its serial number. The Nano status LED will turn green, indicating the CamExpert application is now connected.
- Click on the Grab button for live acquisition (the Nano default is Free Running mode). Focus and adjust the lens iris. See Operational Reference for information on CamExpert parameters with the Nano camera.
- If the Nano has no lens, just select one of the internal test patterns available (*Image Format Controls – Test Image Selector*). All but one are static images to use with the Snap or Grab function of CamExpert. The single “moving” test image is a shifting diagonal ramp pattern, which is useful for testing network/computer bandwidth issues (see following image).
- Refer to the Teledyne DALSA Network Imaging package manual if error messages are shown in the Output Messages pane while grabbing.


CamExpert - [Untitled]
File View Pre-Processing Tools Help
Device Selector
Device: Nano_C1920_1 Nostromo_1
Configuration: Select a camera file (Optional)
Detection: Detect Camera Settings
Parameters - Visibility: Guru
Category
Parameter
Value
Camera Information
Sensor Control
I/O Controls
Counter And Timer Control
Image Format Controls
Acquisition and Transfer Control
Event Control
GigE Vision Transport Layer
File Access Control
GigE Vision Host Controls
Manufacturer Name Teledyne DALSA
Family Name Genie
Model Name Nano C1920
Device Version 1.00
Manufacturer Part Number G3-GC11-C1920
Manufacturer Info Standard Design Raw Bayer
Firmware Version 4CA18.0002
Serial Number A0000102
MAC Address 00:01:0D:C2:01:59
Device User ID Nostromo_1
Device Built-In Self Test Press...
Device Built-In Self Test Status Passed
Device Built-In Self Test Statu... 0
Device Reset Press...
Device Temperature Selector Internal
Device Temperature 46.075756
Power-up Configuration Setting...
<< Less
Feature Display Name: Manufacturer Name
Description: Displays the device vendor name.
Feature Name: DeviceVendorName
Type: IString (SapFeature::TypeString)
Parameters - Visibility: Guru
Display
Grab Snap Trigger 1:1
Position: Pixel data not available
Frame/sec: N/A
Resolution: 1920 Pixels x 1200 Lines RGB 8-8-8-8
Buffer ID:1 << 1 >>
Output Messages
[16:11:44] -- Freeze button was clicked.
[16:11:52] (Nano_C1920_1) -- Trigger Mode value was changed from "On" to "Off"
[16:12:25] (Nano_C1920_1) -- Test Image Selector value was changed from "GreyDiagonalRampMoving" to "Off"
[16:12:26] -- Grab button was clicked.
[16:12:28] -- Freeze button was clicked.
[16:12:31] -- Grab button was clicked.
[16:12:34] -- Freeze button was clicked.
[16:12:42] (Nano_C1920_1) -- Exposure Time value was changed from 2500.000000 to 3500
[16:12:44] -- Grab button was clicked.
[16:12:45] -- Freeze button was clicked.
[16:12:52] (Nano_C1920_1) -- Exposure Time value was changed from 3500.000000 to 4500
[16:12:53] -- Grab button was clicked.
[16:12:55] -- Freeze button was clicked.
[16:13:01] (Nano_C1920_1) -- Test Image Selector value was changed from "Off" to "GreyDiagonalRampMoving"
[16:13:03] -- Grab button was clicked.
[16:13:09] -- Freeze button was clicked.
Output Messages
Ready
C:\Users\spisan\Doc...
CamExpert - [Untitled]
16:13

About the Device User ID

The Nano can be programmed with a user defined name to aid identifying multiple cameras connected to the network. For instance, on an inspection system with 4 cameras, the first camera might be labeled “top view”, the second “left view”, the third “right view” and the last one “bottom view”. The factory default user name is set to match the camera serial number for quick initial identification. Note that the factory programmed Genie Nano serial number and MAC address are not user changeable.

When using CamExpert, multiple Genie Nano cameras on the network are seen as different "Nano-xxxxx" devices as an example. Non Teledyne DALSA cameras are labeled as “GigEVision Device”. Click on a device user name to select it for control by CamExpert.

An imaging application uses any one of these attributes to identify a camera: its IP address, MAC address, serial number or User Name. Some important considerations are listed below.

- Do not use the camera's IP address as identification (unless it is a persistent IP) since it can change with each power cycle.
- A MAC address is unique to a single camera, therefore the control application is limited to the vision system with that unique camera if it uses the camera's MAC address.
- The User Name can be freely programmed to clearly represent the camera usage. This scheme is recommended for an application to identify cameras. In this case, the vision system can be duplicated any number of times with cameras identified by their function, not their serial numbers or MAC address.

Operational Reference

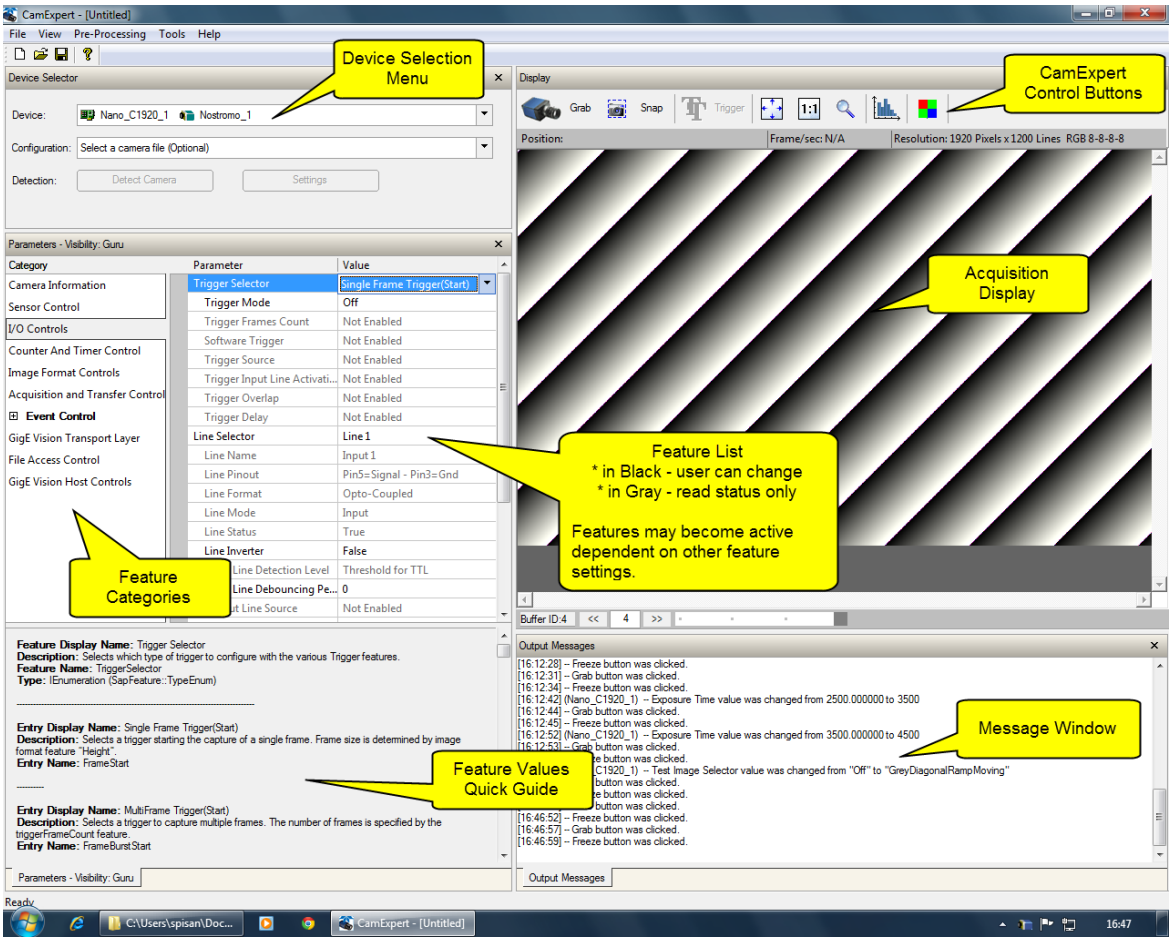
Using CamExpert with Genie Nano Cameras

The Sapera CamExpert tool is the interfacing tool for GigE Vision cameras, and is supported by the Sapera library and hardware. CamExpert allows a user to test camera functions. Additionally CamExpert saves the Nano user settings configuration to the camera or saves multiple configurations as individual camera parameter files on the host system (*.ccf).

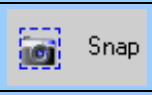
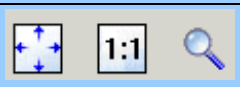
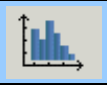
An important component of CamExpert is its live acquisition display window which allows immediate verification of timing or control parameters without the need to run a separate acquisition program.

CamExpert Panes

The various areas of the CamExpert tool are described in the summary figure below. GigE Vision device Categories and Parameter features are displayed as per the device's XML description file. The number of parameters shown is dependent on the View mode selected (i.e. Beginner, Expert, Guru – see description below).



- **Device pane**: View and select from any installed GigE Vision or Sapera acquisition device. After a device is selected CamExpert will only present parameters applicable to that device.
- **Parameters pane**: Allows viewing or changing all acquisition parameters supported by the acquisition device. CamExpert displays parameters only if those parameters are supported by the installed device. This avoids confusion by eliminating parameter choices when they do not apply to the hardware in use.
- **Display pane**: Provides a live or single frame acquisition display. Frame buffer parameters are shown in an information bar above the image window.
- **Control Buttons**: The Display pane includes CamExpert control buttons. These are:

	**Acquisition control button:** Click once to start live grab, click again to stop.
	**Single frame grab:** Click to acquire one frame from device.
	**Software trigger button:** With the I/O control parameters set to Trigger Enabled / Software Trigger type, click to send a single software trigger command.
	**CamExpert display controls:** (these do not modify the frame buffer data) Stretch (or shrink) image to fit, set image display to original size, or zoom the image to any size and ratio. Note that under certain combinations of image resolution, acquisition frame rate, and host computer speed, the CamExpert screen display may not update completely due to the host CPU running at near 100%. This does not affect the acquisition.
	**Histogram / Profile tool:** Select to view a histogram or line/column profile during live acquisition.

- **Output pane**: Displays messages from CamExpert or the GigE Vision driver.

CamExpert View Parameters Option

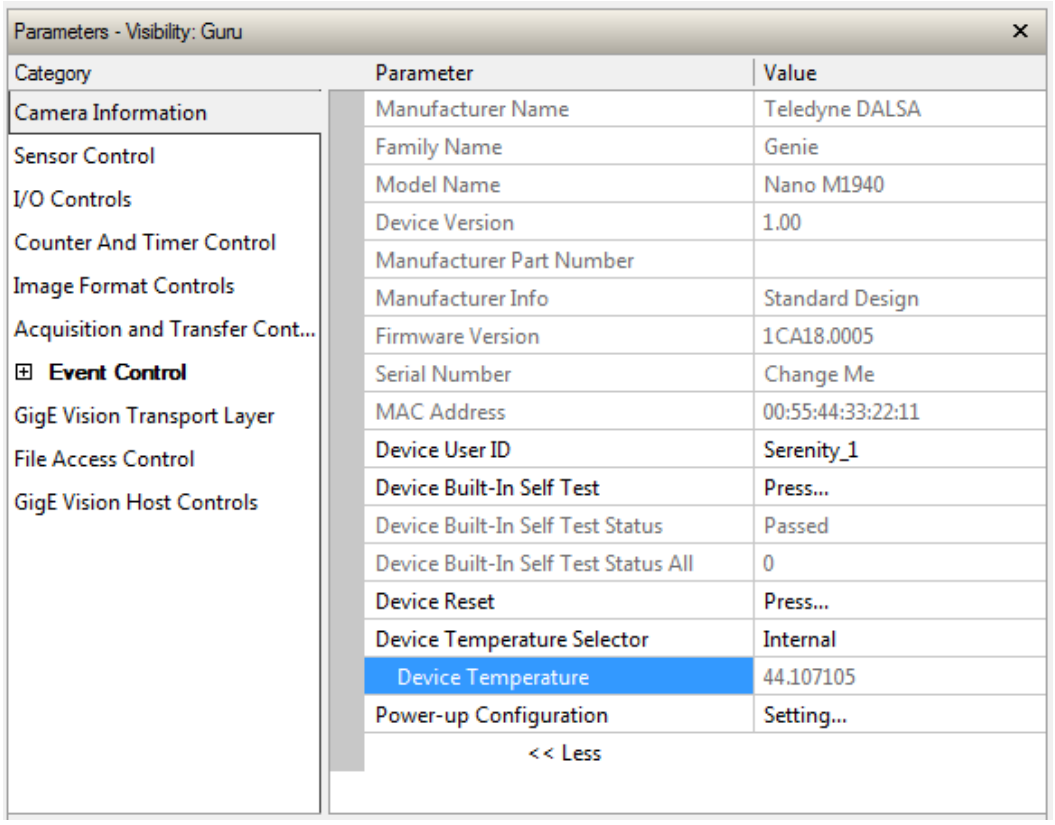
All camera features have a Visibility attribute which defines its requirement or complexity. The states vary from Beginner (features required for basic operation of the device) to Guru (optional features required only for complex operations).

CamExpert presents camera features based on their visibility attribute and provides quick Visibility level selection via controls below each Category Parameter list [<< Less More>>]. The user can also choose the Visibility level from the *View · Parameters Options* menu.

Camera Information Category

Camera information can be retrieved via a controlling application. Parameters such as camera model, firmware version, etc. are read to uniquely identify the connected Nano device. These features are typically read-only. GigE Vision applications retrieve this information to identify the camera along with its characteristics.

Features listed in the description table but tagged as *Invisible* are usually for Teledyne DALSA or third party software usage—not typically needed by end user applications.



Camera Information Feature Descriptions

The following table describes these parameters along with their view attribute and in which device version the feature was introduced. Additionally the Device Version column will indicate which parameter is a member of the DALSA Features Naming Convention (indicated by **DFNC**), versus the GenICam Standard Features Naming Convention (SFNC tag is not shown).

New features for a major device version release will be indicated by green text for easy identification.

Display Name	Feature & Values	Description	Device Version & View
Manufacturer Name	DeviceVendorName	Displays the device vendor name.	1.00 Beginner
Family Name	DeviceFamilyName	Displays the device family name.	1.00 Beginner
Model Name	DeviceModelName	Displays the device model name.	1.00 Beginner
Device Version	DeviceVersion	Displays the device version. This tag will also highlight if the firmware is a beta or custom design. (RO)	1.00 Beginner
Manufacturer Part Number	deviceManufacturerPartNumber	Displays the device manufacturer part number.	1.00 DFNC Beginner
Manufacturer Info	DeviceManufacturerInfo	This feature provides extended manufacturer information about the device. Genie Nano cameras show which firmware design is currently loaded.	1.00 Beginner
Firmware Version	DeviceFirmwareVersion	Displays the currently loaded firmware version number. Firmware files have a unique number and have the .cbf file extension.	1.00 Beginner
Serial Number	DeviceSerialNumber	Displays the device's factory set serial number.	1.00 Expert
MAC Address	deviceMacAddress	Displays the unique MAC (Media Access Control) address of the Device.	1.00 DFNC Beginner
Device User ID	DeviceUserID	Feature to store a user-programmable identifier of up to 15 characters. The default factory setting is the camera serial number. (RW)	1.00 Beginner
Device Temperature Selector	DeviceTemperatureSelector	Select the source where the temperature is read.	1.00 Beginner
Internal	*Internal*	*User feature . Interpolated value from FPGA and or PHY temperature.*	
MaxInternal	*MaxInternal*	*Records the highest device temperature since power up. Value is reset on power off.*	
Device Temperature	DeviceTemperature	The temperature of the selected source in degrees Celsius	
Power-up Configuration Selector	UserSetDefaultSelector	Selects the camera configuration set to load and make active on camera power-up or reset. The camera configuration sets are stored in camera non-volatile memory. (RW)	1.00 Beginner
None	*None*		
Factory Setting	*Default*	*Load factory default feature settings.*	1.00 Beginner
UserSet1	*UserSet1*	*Select the user defined configuration UserSet 1 as the Power-up Configuration.*	
UserSet2	*UserSet2*	*Select the user defined configuration UserSet 2 as the Power-up Configuration.*	
User Set Selector	UserSetSelector	Selects the camera configuration set to load feature settings from or save current feature settings to. The Factory set contains default camera feature settings. (RW)	
Factory Setting	*Default*	*Select the default camera feature settings saved by the factory.*	
UserSet 1	*UserSet1*	*Select the User Defined Configuration space UserSet1 to save to or load from features settings previously saved by the user.*	1.00 Beginner

UserSet 2	*UserSet2*	*Select the User Defined Configuration space UserSet1 to save to or load from features settings previously saved by the user.*	
Load Configuration	UserSetLoad	Loads the camera configuration set specified by the User Set Selector feature, to the camera and makes it active. Can not be updated during a Sapera transfer. (W)	
Save Configuration	UserSetSave	Saves the current camera configuration to the user set specified by the User Set Selector feature. The user sets are located on the camera in non-volatile memory. (W)	
Device Built-In Self Test	deviceBIST	Command to perform an internal test which will determine the device status. (W)	1.00 Beginner
Device Built-In Self Test Status	deviceBISTStatus	Return the status of the device Built-In Self test. Possible return values are device-specific.	1.00 Beginner
Passed	*Passed*	*No failure detected*	1.00 DFNC Beginner
Last firmware update failed	*FirmwareUpdateFailure*	*Last firmware update operation failed.*	1.00 Beginner
Unexpected Error	*Unexpected_Error*	*Switched to recovery mode due to unexpected software error.*	
Device Built-In Self Test Status All	deviceBISTStatusAll	Return the status of the device Built-In Self-Test as a bitfield. The meaning for each bit is device-specific.	
Device Reset	DeviceReset	Resets the device to its power up state. (W)	
Serial Number	DeviceID	Displays the device's factory set camera serial number.	1.00 Beginner
Power-up Configuration Selector	UserSetDefault	Specify the camera configuration set to load and make active on camera power-up or reset. The camera configuration sets are stored in camera non-volatile memory.	
None	*None*	*Keep Internal configuration.*	1.00 Invisible
Factory Setting	*Default*	*Select the Factory Setting values as the Power-up Configuration.*	1.00 Invisible
UserSet1	*UserSet1*	*Select the user defined configuration UserSet 1 as the Power-up Configuration.*	
UserSet2	*UserSet2*	*Select the user defined configuration UserSet 2 as the Power-up Configuration.*	
Calibration Date	deviceCalibrationDateRaw	Date when the camera was calibrated.	
Device Acquisition Type	deviceAcquisitionType	Displays the Device Acquisition Type of the product.	
Sensor	*Sensor*	*The device gets its data directly from a sensor.*	1.00 DFNC Invisible
Device TL Type	DeviceTLType	Transport Layer type of the device.	1.00 DFNC Invisible
GigE Vision	*GigEVision*	*GigE Vision Transport Layer*	
Device TL Version Major	DeviceTLVersionMajor	Major version of the device's Transport Layer.	1.00 Invisible
Device TL Version Minor	DeviceTLVersionMinor	Minor version of the device's Transport Layer.	
	userSetError		1.00 Invisible
	NoError	*No Error*	1.00 Invisible
	LoadGenericError	*Unknown error*	1.00 DFNC
	LoadBusyError	*The camera is busy and cannot perform the action*	

	LoadMemoryError	*Not enough memory to load set*	Invisible
	LoadFileError	*Internal file I/O error*	
	LoadInvalidSetError	*At least one register could not be restored properly*	
	LoadResourceManagerError	*An internal error happened related to the resource manager*	
	SaveGenericError	*Unknown error*	
	SaveBusyError	*The camera is busy and cannot perform the action*	
	SaveMemoryError	*Camera ran out of memory while saving set*	
	SaveFileError	*Internal file I/O error*	
	SaveInvalidSetError	*An invalid user set was requested*	
	SaveResourceManagerError	*An internal error happened related to the resource manager*	
DFNC Major Rev	deviceDFNCVersionMajor	Major revision of Dalsa Feature Naming Convention which was used to create the device's XML.	
DFNC Minor Rev	deviceDFNCVersionMinor	Minor revision of Dalsa Feature Naming Convention which was used to create the device's XML.	
SFNC Major Rev	DeviceSFNCVersionMajor	Major Version of the Genicam Standard Features Naming Convention which was used to create the device's XML.	1.00 DFNC Invisible
SFNC Minor Rev	DeviceSFNCVersionMinor	Minor Version of the Genicam Standard Features Naming Convention which was used to create the device's XML.	1.00 DFNC Invisible
SFNC SubMinor Rev	DeviceSFNCVersionSubMinor	SubMinor Version of the Genicam Standard Features Naming Convention which was used to create the device's XML.	1.00 Invisible
			1.00 Invisible
			1.00 Invisible

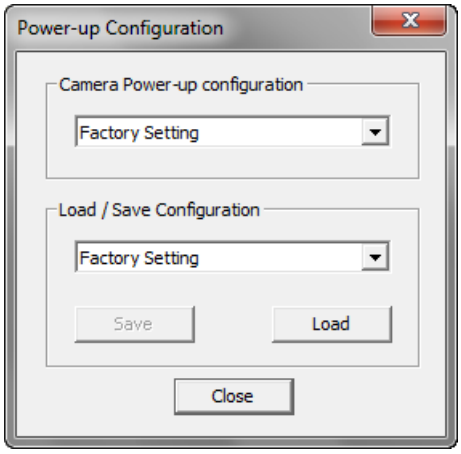
Temperature Management

Genie Nano cameras are designed to optimally transfer internal component heat to the outer metallic body. If the camera is free standing (i.e. not mounted) it will be very warm to the touch.

Basic heat management is achieved by mounting the camera onto a metal structure via its mounting screw holes. Heat dissipation is improved by using thermal paste between the camera body (not the front plate) and the metal structure.

Power-up Configuration Dialog

CamExpert provides a dialog box which combines the features to select the camera power-up state and for the user to save or load a Nano camera state.



Camera Power-up Configuration

The first drop list selects the camera configuration state to load on power-up (see feature *UserSetDefaultSelector*). The user chooses from one factory data set or one of two possible user saved states.

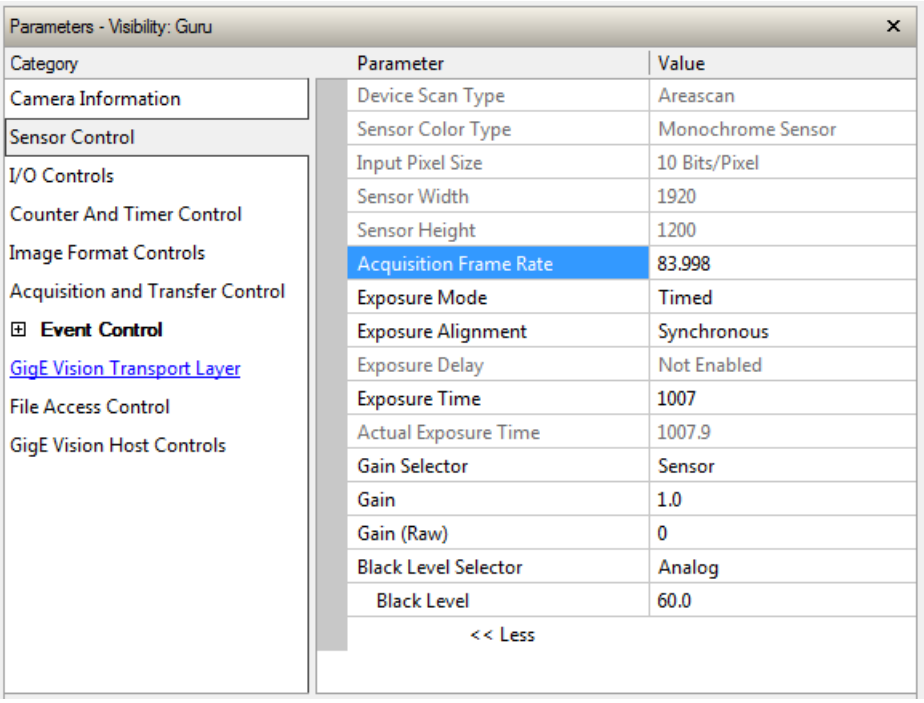
Load / Save Configuration

The second drop list allows the user to change the camera configuration any time after a power-up (see feature *UserSetSelector*). To reset the camera to the factory configuration, select *Factory Setting* and click Load. To save a current camera configuration, select User Set 1 or 2 and click Save. Select a saved user set and click Load to restore a saved configuration.

Sensor Control Category

The Genie Nano sensor controls, as shown by CamExpert, groups sensor specific parameters. This group includes controls for frame rate, exposure time, gain, etc. Parameters in gray are read only, either always or due to other feature settings. Parameters in black are user set in CamExpert or programmable via an imaging application.

Features listed in the description table that are tagged as *Invisible* are usually for Teledyne DALSA or third party software usage—not typically needed by end user applications. Also important, features shown by CamExpert may change with different Genie Nano models implementing different sensors, image resolutions, and color versions.



Sensor Control Feature Descriptions

The following table describes these features along with their view attribute and device framework version. For each feature the device version may differ for each camera sensor available. Such differences are indicated for any applicable feature.

When a Device Version number is indicated, this represents the camera software functional group, not a firmware revision number. As Genie Nano capabilities evolve the device version will increase, therefore identifying the supported function package. New features for a major device version release will be indicated by green text for easy identification.

The first column indicates whether a feature applies to monochrome or color camera models via a symbol. No symbol indicates a common feature. Additionally the description column will indicate which feature is a member of the DALSA Features Naming Convention (indicated by DFNC), versus the GenICam Standard Features Naming Convention (SFNC tag is not shown).

B/W Color	Display Name	Feature & Values	Description
	Device Scan Type	DeviceScanType	Defines the scan type of the device's sensor. Genie Nano is an Areascan camera. < RO, Beginner >
	Areascan	*Areascan*	*Device uses an Areascan sensor.*
	Sensor Color Type	sensorColorType	Defines the camera sensor color type. < RO, DFNC, Beginner >
	*Monochrome Sensor*	*Monochrome*	*Sensor color type is monochrome.*
	*Bayer Sensor*	*CFA_Bayer*	*Sensor color type is Bayer Color Filter Array (CFA).*
	Input Pixel Size	pixelSizeInput	Size of the image input pixels, in bits per pixel. < RO, DFNC, Guru >
	10 Bits/Pixel	*Bpp10*	*Sensor output data path is 10 bits per pixel.*
	12 Bits/Pixel	*Bpp12*	*Sensor output data path is 12 bits per pixel.*
	Sensor Width	SensorWidth	Defines the sensor width in active pixels. < RO, Expert >
	Sensor Height	SensorHeight	Defines the sensor height in active lines. < RO, Expert >
	Acquisition Frame Rate	AcquisitionFrameRate	Specifies the camera internal frame rate, in Hz. Any user entered value is automatically adjusted to a valid camera value. Note that a change in frame rate takes effect only when the acquisition is stopped and restarted. < Beginner >
	Exposure Mode	ExposureMode	Sets the operation mode for the camera's exposure (or electronic shutter). < Beginner >
	Timed	*Timed*	*The exposure duration time is set using the Exposure Time feature and the exposure starts with a FrameStart event.*
	Trigger Width	*TriggerWidth*	*Uses the width of the trigger signal pulse to control the exposure duration. Use the Trigger Activation feature to set the polarity of the trigger.* *The Trigger Width setting is applicable with TriggerSelector = Framestart.*

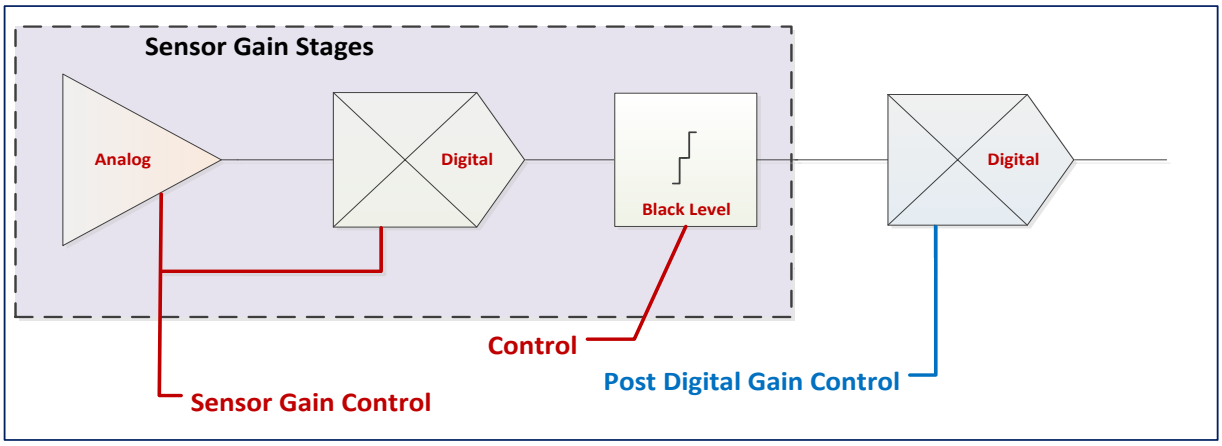
	Exposure Alignment	exposureAlignment	Exposure Alignment specifies how the exposure is executed in relationship to the sensor capabilities and current frame trigger. < DFNC Beginner >
	Synchronous	*Synchronous*	*Exposure is synchronous to the internal timing of the sensor. The readout is concurrent to the exposure for the fastest possible frame rate. When a valid trigger is received and the ExposureTime is shorter than the readout period, the ExposureStart event is latched in the previous frame's readout. That is; the ExposureStartEvent is delayed and is initiated when the actual exposure starts such that the exposure ends and readout begins as soon as the previous readout has completed.*
	Exposure Delay	exposureDelay	Specifies the delay in microseconds (µs) to apply after the FrameStart event before starting the ExposureStart event. < DFNC Beginner >
	Exposure Time	ExposureTime	Sets the exposure time (in microseconds) when the Exposure Mode feature is set to Timed. < Beginner >
	Actual Exposure Time	exposureTimeActual	Actual Exposure Time performed by sensor due to its design, based on the requested Exposure Time. < Beginner >
	Gain Selector	GainSelector	Selects which gain is controlled when adjusting gain features. < Beginner >
	Sensor	*SensorAll*	*Apply a gain adjustment within the sensor to the entire image. The first half of the gain range is applied in the analog domain and the second half is digital.*
	Digital	*DigitalAll*	*Apply a digital gain adjustment to the entire image. This independent gain factor is applied to the image after the sensor.*
	Gain	Gain	Sets the selected gain as an amplification factor applied to the image. User adjusts the *Gain* feature or the *GainRaw* feature. < Beginner >
	Gain (Raw)	GainRaw	Raw Gain value that is set in camera (Model Specific for range and step values). < Guru>
	Black Level Selector	BlackLevelSelector	Selects which Black Level to adjust using the Black Level features. < Beginner >
	Analog	*AnalogAll*	*Sensor Dark Offset*
	Black Level	BlackLevel	Controls the black level as an absolute physical value. This represents a DC offset applied to the video signal, in DN (digital number) units. The Black Level Selector feature specifies the channel to adjust. < Beginner >

Offset/Gain Control Details

Applies to Nano models using Sony IMX174/249 sensors (Monochrome or Color)

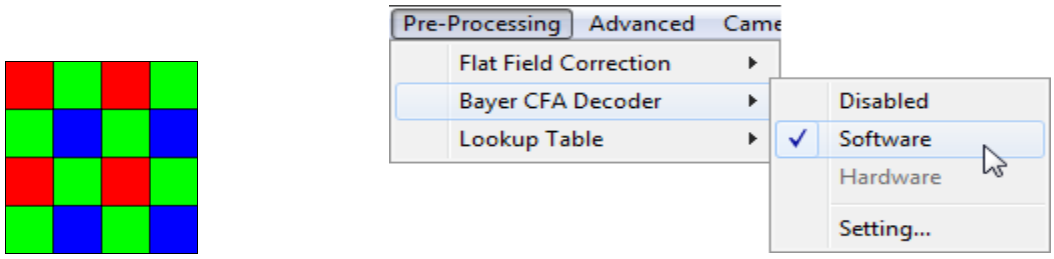
The Gain and Black level functions are applied at the sensor and/or on the digital image values output by the sensor, as described below.

- **Gain Selector = Sensor**: The gain function controls the sensor hardware. Sensor gain is applied first by an analog amplifier (from 0 to +24dB) and then continues automatically via a digital amplifier (from +25 to +54 dB). Note that digital noise increases linearly with higher gain values.
- **Gain**: Values are a linear range from 1 to n in 0.01 steps. The entered value is automatically converted to dB to control sensor gain. Users can also control gain via the Gain(Raw) feature.
- **Gain (Raw)**: An alternative method to control sensor gain, where values entered represent 0.1dB increments. The value range is 0 to 480 which controls a 0 to 48dB gain range.
- **Black Level**: This offset variable exists within the sensor. The Sony sensors allow an offset range between 0 and 511 DN. The factory settings default value for each sensor used by various Nano models, is recommended as per the sensor manufacturer design specifications. **Note:** With the factory default offset, testing a camera's black output in 8-bit mode may show a 2 DN value difference across the image. Changing the Black Level value up or down will push sensor noise (present at the sensors native bits per pixel) to fall within one 8-bit value, thus the noise becomes hidden.
- **Gain Selector = Digital**: The gain function controls the post sensor digital amplifier (available only on some models of Nano cameras). This gain factor is independent of any sensor gain set. This setting is a linear number range of 1 to 4 in 0.1 steps).



Bayer Mosaic Pattern

Genie Nano Color cameras (using Sony IMX174/249 sensors) output raw Bayer image data using the mosaic pattern shown below. Teledyne DALSA Sapera CamExpert tool interprets the raw Bayer output when the user enables the Pre-Processing Software Bayer Decoder. CamExpert also provides an automatic white balance tool to aid RGB gain adjustments.

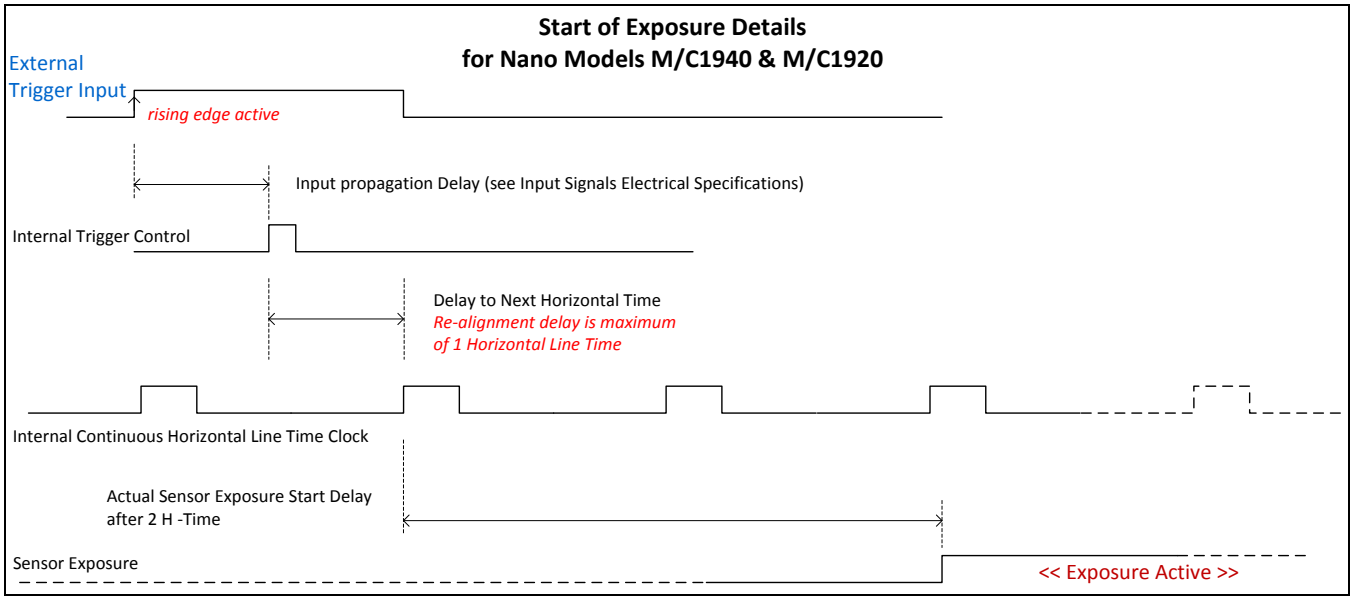


Bayer Mosaic Pattern and the CamExpert processing function to decode the Genie Nano Color

Native Sensor Exposure Timing

Nano cameras make use of various sensors from different manufacturers. Each of these sensor families will have timing characteristics which need to be understood when designing externally triggered imaging applications. This section describes these AC characteristics for each Nano sensor family.

External Trigger Characteristics: Models M/C1940 & M/C1920



Exposure Controls Detail

Exposure Control modes define the method and timing of controlling the sensor integration period. The integration period is the amount of time the sensor is exposed to incoming light before the video frame data is transmitted to the controlling computer.

- Exposure control is defined as the start of exposure and exposure duration.
- The feature **Exposure Mode** selects the controlling method for the exposure.
- The start of exposure is initiated by an internal timer signal, an external input trigger signal, or a software function call.
- The exposure duration can be programmable (ExposureMode = Timed) or controlled by the external input trigger pulse width (ExposureMode = TriggerWidth).

Synchronous Mode Timing

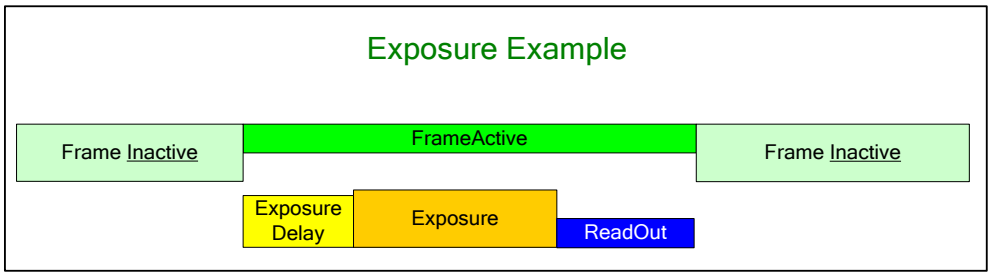
Synchronous Mode: Exposure is synchronous to the line timing of the sensor. Exposure time steps are 1µs and the readout can be concurrent to the exposure for the fastest possible frame rate.

- Synchronous mode starts the exposure period aligned to the sensor horizontal line timing and the programmable duration steps are 1µs.
- Exposure duration is from a camera sensor specific minimum (in µs) up to 16 sec.
- In this mode, sensor exposure and sensor readout of the previous frame's exposure occur simultaneously. This allows operating the sensor up to its maximum frame rate.
- Any trigger received before the start of frame readout is ignored and generates an invalid frame trigger event.
- Since the external trigger is asynchronous with the Nano horizontal line timing, the frame exposure start is subject to 1 horizontal line jitter.

Internal Programmable Exposure (ExposureMode = Timed)

The Genie Nano in Internal Programmable Timed Exposure mode has the following features:

- Programmable internal trigger, where the maximum and minimum sensor frame rate limits are defined by the *ExposureTime* feature.
- Exposure synchronization timing is Synchronous Mode where the exposure is aligned with the sensor horizontal line timing and the next acquisition is triggered by an internal programmable timer.
- Exposure duration is user programmable
  - Exposure maximum is dependent on the frame rate.
  - Minimum exposure (in µs) is model dependent.
- Image readout is simultaneous where the grabbed image frame is readout during the next frame exposure time. This allows for fastest possible frame rates.

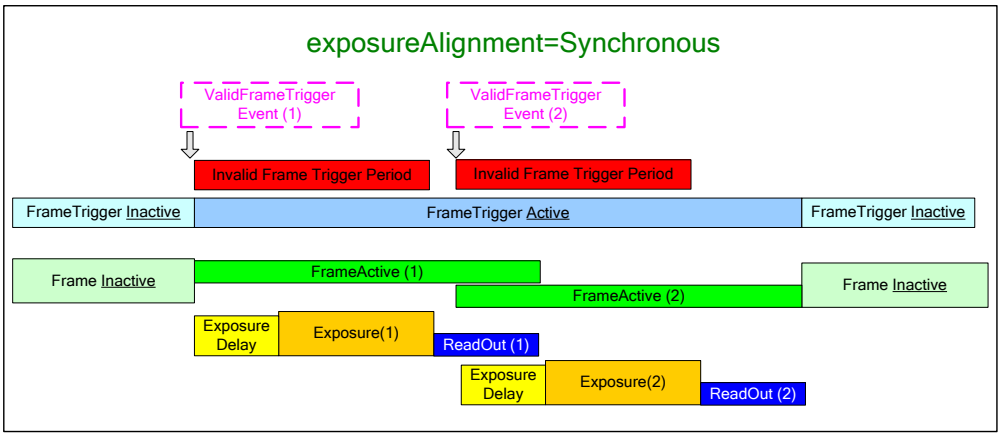


Free-running Exposure Timing

External Trigger: Programmable Exposure

- Also known as “Edge Pre-select” exposure. See timing diagram below.
- An external trigger edge initiates the exposure process.
- The user programmable delay (exposureDelay) from valid trigger edge to start of exposure is camera model specific.
- Supports Synchronous Mode timing for fastest possible frame rates. Start of exposure is aligned on the next horizontal line while the exposure duration period is in 1µs steps. Exposure and sensor readout can be concurrent.
- Exposure duration is programmable from the model dependent minimum to 16 seconds (in 1µs steps).

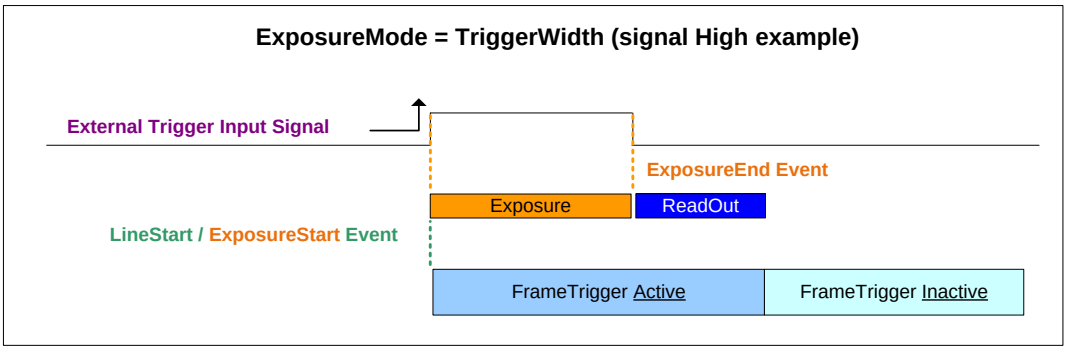
- Any external trigger received before the last exposure is ignored.



External Trigger Programmable Synchronous Mode Exposure Timing

External Trigger: Trigger Width Exposure

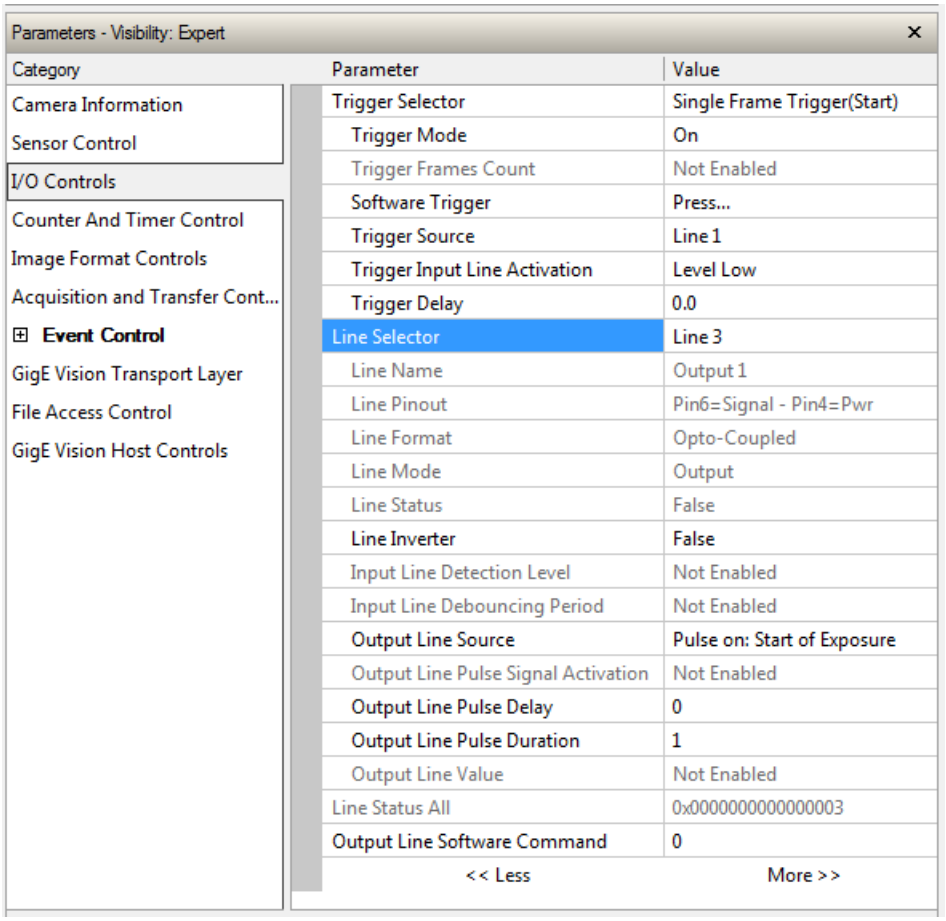
- The following graphic shows an exposure started by an external active high trigger and duration controlled by the signal width.
- External Trigger input on Line 1 or Line 2.



I/O Control Category

The Genie Nano I/O controls, as shown by CamExpert, groups features used to configure external inputs and acquisition actions based on those inputs, plus camera output signals to other devices. Parameters in gray are read only, either always or due to another parameter being disabled. Parameters in black are user set in CamExpert or programmable via an imaging application.

Features listed in the description table but tagged as *Invisible* are usually for Teledyne DALSA or third party software usage—not typically needed by end user applications. Also important, Genie Nano cameras are available in a number of models implementing different sensors which may support different features within this category.



I/O Control Feature Descriptions

The following table describes these features along with their view attribute and minimum camera firmware version required. Additionally the Device Version column will indicate which parameter is a member of the DALSA Features Naming Convention (indicated by DFNC), versus the GenICam Standard Features Naming Convention (SFNC tag is not shown).

The Device Version number represents the camera software functional group, not a firmware revision number. As Genie Nano capabilities evolve the device version tag will increase, therefore identifying the supported function package. New features for a major device version release will be indicated by green text for easy identification.

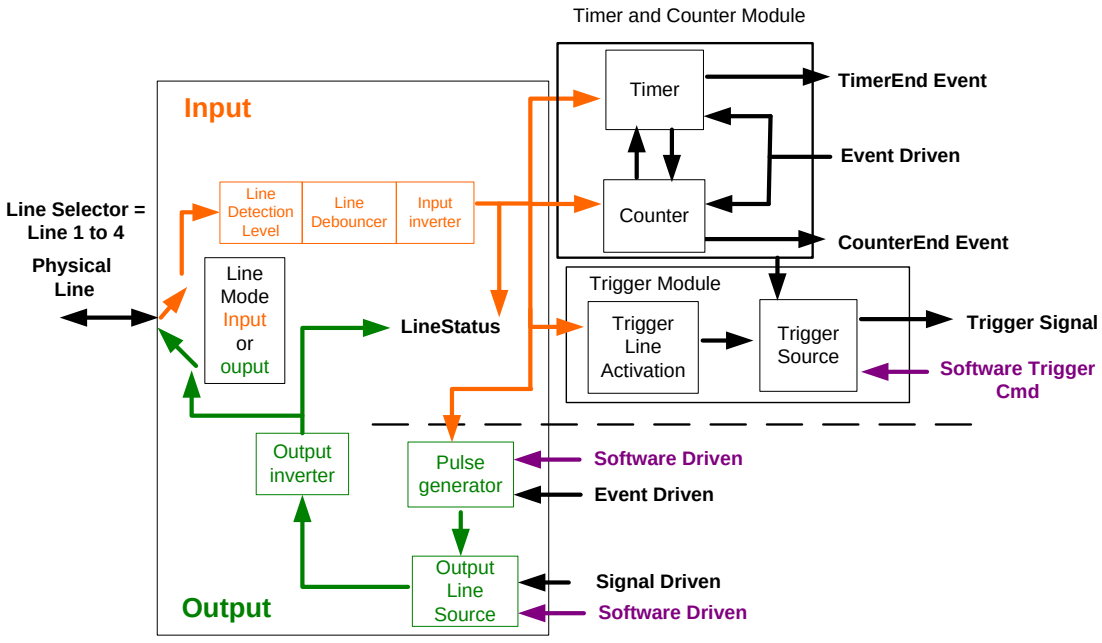
Display Name	Feature & Values	Description	Device Version & View
Trigger Selector	TriggerSelector	Selects which type of trigger to configure with the various Trigger features.	1.00 Beginner
Single Frame Trigger(Start)	*FrameStart*	*Selects a trigger starting the capture of a single frame. Frame size is determined by image format feature "Height".*	
MultiFrame Trigger(Start)	*FrameBurstStart*	*Selects a trigger to capture multiple frames. The number of frames is specified by the "triggerFrameCount" feature.*	
Trigger Mode	TriggerMode	Controls the enable state of the selected trigger.	1.00 Beginner
Off	*Off*	*The selected trigger is turned off.*	
On	*On*	*The selected trigger is turned active.*	
Trigger Frames Count	triggerFrameCount	Sets the total number of frames to acquire when a valid trigger is received. This feature is available only when TriggerSelector = FrameBurstStart.	1.00 DFNC Beginner
Software Trigger	TriggerSoftware	Generate a software command internal trigger immediately no matter what the TriggerSource feature is set to.	1.00 Beginner
Trigger Source	TriggerSource	Specifies the internal signal or physical input line to use as the trigger source. The selected trigger must have its TriggerMode set to ON. See Input Signals Electrical Specifications.	1.00 Beginner
Line 1	*Line1*	*Select Line 1 (and associated I/O control block) to use as the external trigger source. See LineSelector feature for complete list.*	
Line 2	*Line2*	*Select Line 2 (and associated I/O control block) to use as the external trigger source. See LineSelector feature for complete list.*	
Software	*Software*	*The trigger command source is only generated by software using the Trigger Software command.*	
Timer1End Event	*Timer1End*	*Select the TimerEnd Event as the internal trigger source.*	
Counter1End Event	*Counter1End*	*Select the CounterEnd Event as the internal trigger source.*	
Trigger Input Line Activation	TriggerActivation	Select the activation mode for the selected Input Line trigger source. This is applicable only for external line inputs.	1.00 Beginner
Rising Edge	*RisingEdge*	*The trigger is considered valid on the rising edge of the line source signal (after any processing by the line inverter module).*	
Falling Edge	*FallingEdge*	*The trigger is considered valid on the falling edge of the line source signal (after any processing by the line inverter module).*	

Any Edge	*AnyEdge*	*The trigger is considered valid on any edge of the line source signal (after any processing by the line inverter module).*	
Level High	*LevelHigh*	*The trigger is considered valid on the high level of the line source signal.*	
Level Low	*LevelLow*	*The trigger is considered valid on the low level of the line source signal.*	
Trigger Delay	TriggerDelay	Specifies the delay in microseconds to apply after receiving the trigger and before activating the triggerEvent. (min=0, max=2000000)	1.00 Beginner
Trigger Overlap	TriggerOverlap	States if a trigger overlap is permitted with the Active Frame readout signal. This read only feature defines if a new valid trigger will be accepted (or latched) for a new frame.	1.00 Guru
Off	*Off*	*No trigger overlap is permitted.*	
ReadOut	*ReadOut*	*Trigger is accepted immediately after the exposure period.*	
Line Selector	LineSelector	Selects the physical line (or pin) of the external device connector to configure.	1.00 Beginner
Line 1	*Line1*	*Index of the physical line and associated I/O control block to use. Pin 5 is the Input Signal and Pin 3 is the common Ground on the I/O connector.*	
Line 2	*Line2*	*Index of the physical line and associated I/O control block to use. Pin 7 is the Input Signal and Pin 3 is the common Ground on the I/O connector.*	
Line 3	*Line3*	*Index of the physical line and associated I/O control block to use. Pin 6 is the Output Signal and Pin 4 is the common output power on the I/O connector.*	
Line 4	*Line4*	*Index of the physical line and associated I/O control block to use. Pin 8 is the Output Signal and Pin 4 is the common output power on the I/O connector.*	
Line Name	lineName	Description of the physical Pin associated with the logical line.	1.00 Beginner DFNC
Input 1 *Input 2*	*Input1* *Input2*	*Associated with the logical line Input 1* *Associated with the logical line Input 2*	
Output 1 *Output 2*	*Output1* *Output2*	*Associated with the logical line Output 1* *Associated with the logical line Output 2*	
Line Format	LineFormat	Specify the current electrical format of the selected physical input or output. (RO)	1.00 Expert
Opto-Coupled	*OptoCoupled*	*The line is opto-Coupled.*	
Line Mode	LineMode	Reports if the physical Line is an Input or Output signal. (RO) See Input Signals Electrical Specifications. See Output Signals Electrical Specifications.	1.00 Expert
Input	*Input*	*The line is an input line.*	
Output	*Output*	*The line is an output line.*	
Line Status	LineStatus	Returns the current status of the selected input or output line.	1.00 Expert
	False / True		
Line Status All	LineStatusAll	Returns the current status of all available line signals, at time of polling, in a single bitfield. The order is Line1, Line2, Line3, ...	1.00 Expert
Line Inverter	LineInverter	Control to invert the polarity of the selected input or output line signal.	1.00 Beginner
	False / True		
Input Line Detection Level	lineDetectionLevel	Specifies the voltage threshold required to recognize a signal transition on an input line.	1.00 Beginner

Threshold for TTL	*Threshold_for_TTL*	*A signal below 0.8V will be detected as a Logical LOW and a signal greater than 2.4V will be detected as a Logical HIGH on the selected input line.*	DFNC
Input Line Debouncing Period	lineDebouncingPeriod	Specifies the minimum delay before an input line voltage transition is recognizing as a signal transition.	1.00 Beginner DFNC
Output Line Source	outputLineSource	Selects which internal signal or event driven pulse or software control state to output on the selected line. Note, the LineMode feature must be set to Output. The List of supported output line sources is product-specific. The Event Control section provides details and timing diagrams for the supported trigger modes.	1.00 Beginner DFNC
Off	*Off*	*Line output is Open*	
Software Controlled	*SoftwareControlled*	*The OutputLineValue feature changes the state of the output*	
Pulse on: Start of Frame	*PulseOnStartofFrame*	*Generate a pulse on the start of the Frame Active event*	
Pulse on: Start of Exposure	*PulseOnStartofExposure*	*Generate a pulse on the ExposureStart event. This option is typically used to trigger a strobe light.*	
Pulse on: End of Exposure	*PulseOnEndofExposure*	*Generate a pulse on the ExposureEnd event. This option is typically used to trigger a strobe light.*	
Pulse on: Start of Readout	*PulseOnStartofReadout*	*Generate a pulse on the ReadoutStart event.*	
Pulse on: End of Readout	*PulseOnEndofReadout*	*Generate a pulse on the ReadoutEnd event.*	
Pulse on: Valid Frame Trigger	*PulseOnValidFrameTrigger*	*Generate a pulse on the ValidFrameTrigger event.*	
Pulse on: Rejected Frame(s) Trigger	*PulseOnInvalidFrameTrigger*	*Generate a pulse on the InvalidFrameTrigger event.*	
Pulse on: Start of Acquisition	*PulseOnStartofAcquisition*	*Generate a pulse when the AcquisiontStart event occurs.*	
Pulse on: End of Acquisition	*PulseOnEndofAcquisition*	*Generate a pulse when the AcquisiontStop event occurs.*	
Pulse on: End of Timer 1	*PulseOnEndofTimer1*	*Generate a pulse on the TimerEnd 1 event.*	
Pulse on: End of Counter 1	*PulseOnEndofCounter1*	*Generate a pulse on the CounterEnd 1 event.*	
Pulse on: Input 1 Event	*PulseOnInput1*	*Generate a pulse on the Input signal 1 event*	
Pulse on: Input 2 Event	*PulseOnInput2*	*Generate a pulse on the Input signal 2 event*	
Pulse on: Software Command	*PulseOnSoftwareCmd*	*Generate a pulse on the Input of a Software Command*	
Output Line Pulse Signal Activation	outputLinePulseActivation	Specifies the input line activation mode to trigger the OutputLine pulse.	1.00 Beginner DFNC
Rising Edge	*RisingEdge*	*Specifies that the trigger is considered valid on the rising edge of the source signal.*	
Falling Edge	*FallingEdge*	*Specifies that the trigger is considered valid on the falling edge of the source signal.*	
Any Edge	*AnyEdge*	*Specifies that the trigger is considered valid on the falling or rising edge of the source signal.*	
Output Line Pulse Delay	outputLinePulseDelay	Sets the delay (in µs) before the output line pulse signal. Applicable for the OutputLineSource feature.	1.00 Beginner DFNC
Output Line Pulse Duration	outputLinePulseDuration	Sets the width (duration) of the output line pulse in microseconds.	1.00 Beginner DFNC
Output Line Value	outputLineValue	Sets the output state of the selected Line if the outputLineSoftwareLatchControl = OFF. OutputLineSource must be SoftwareControlled. If the outputLineSoftwareLatchControl = Latch , the state of the pin will change with the outputLineSoftwareCmd command.	1.00 Beginner DFNC
Active	*Active*	*Sets the Output circuit to close*	

Inactive	*Inactive*	*Sets the Output circuit to open*	
Output Line Software Latch Control	outputLineSoftwareLatchControl	When Off, the selected output line is set with the value in Output Line Value.	1.00 Guru DFNC
Off	*Off*	*Output pin state set by outputLineValue.*	
Latch	*Latch*	*Output pin state set by outputLineSoftwareCmd.*	
Output Line Software Command	outputLineSoftwareCmd	Writing a value of 1 in the bit field applies the Latch value of the outputLineSoftwareLatchControl and/or executes the PulseOnSoftwareCmd for any output line programmed for software control. The feature outputLineSoftwareCmd can take any binary value and each bit set to 1 corresponds to a Icommand for an Output. Note that Outputs are numbered from 1 to N, therefore Bit 1 of outputLineSoftwareCmd corresponds to Output1. This is applicable to OutputLineSource = Pulse On: where Software Cmd (for Pulse mode) or OutputLineSource = SoftwareControlled and OutputLineSoftwareLatchControl = Latch (for static states).	1.00 Expert DFNC
Line Pinout	linePinAssociation	Enumeration of the physical line (or pin) on the device I/O connector. (RO)	1.00 Invisible
Pin5=Signal – Pin3=Gnd	*Pin5Signal_Pin3Gnd*	*Pin 5 is the Input Signal and Pin 3 is the common input Ground on the I/O connector.*	
Pin7=Signal – Pin3=Gnd	*Pin7Signal_Pin3Gnd*	*Pin 7 is the Input Signal and Pin 3 is the common input Ground on the I/O connector.*	
Pin6=Signal - Pin4=Pwr	*Pin6Signal_Pin4Pwr*	*Pin 6 is the Output Signal and Pin 4 is the common output Power on the device connector.*	
Pin8=Signal - Pin4=Pwr	*Pin8Signal_Pin4Pwr*	*Pin 8 is the Output2 Signal and Pin 4 is the common output Power on the device connector.*	

I/O Module Block Diagram



Trigger Mode Details

Genie Nano image exposures are initiated by an event. The trigger event is either the camera's programmable internal clock used in free running mode, an external input used for synchronizing exposures to external triggers, or a programmed function call message by the controlling computer. These triggering modes are described below.

- **Free running (Trigger Mode=Off)**: The Nano free-running mode has programmable internal timers for frame rate and exposure period. Frame rate minimums, maximums, and increments supported are sensor specific. Maximum frame rates are dependent on the required exposure.
- **External trigger (Trigger Mode=On)**: Exposures are controlled by an external trigger signal where the specific input line is selected by the **Trigger Source** feature. External signals are isolated by an opto-coupler input with a time programmable debounce circuit.

Trigger Source Types (Trigger Mode=On)

- **Trigger Source=Software**: An exposure trigger is sent as a control command via the Ethernet network connection. Software triggers cannot be considered time accurate due to network latency and sequential command jitter. But a software trigger is more responsive than calling a single-frame acquisition since the latter must validate the acquisition parameters and modify on-board buffer allocation if the buffer size has changed since the last acquisition.
- **Trigger Source = Line 1 or 2**: An external trigger signal is opto-coupled and subject to a signal debounce, input delay, plus inversion circuits.
- **Trigger Line Polarity:** For external line signals, a rising edge signal is suggested to minimize the time it takes for the opto-coupler to change state.
- **Trigger Source=Timer1End Event:** The Timer1 End Event is used as the internal trigger source. Refer to Counter and Timer Controls for information on those features.
- **Trigger Source=Counter1End Event**: The Counter1 End Event is used as the internal trigger source.

Input Line Details

The general purpose input line signals are connected to I/O lines 1 and 2, which have the following features for control or status indication.

- **Feature set:** LineSelector (RW), LineName (RO), linePinAssociation (RO), LineFormat (RO), LineMode (RO), lineDetectionLevel (RW), lineDebouncingPeriod (RW), LineInverter (RW), LineStatus (RO).
- **Connector:** See 10-pin I/O Connector Details for connector pinout and electrical information. The cable shell and shield should electrically connect the Genie Nano chassis to computer chassis for maximum EMI protection.
- **Line Transition Validation:** Each input incorporates a signal debounce circuit (following the opto-couple) to eliminate short noise transitions that could be wrongly interpreted as a valid pulse. The duration is user-programmable from 0µs to 255µs with CamExpert.
- **Line Signal Propagation & Timing:** Maximum delay values are defined in Input Signals Electrical Specifications.

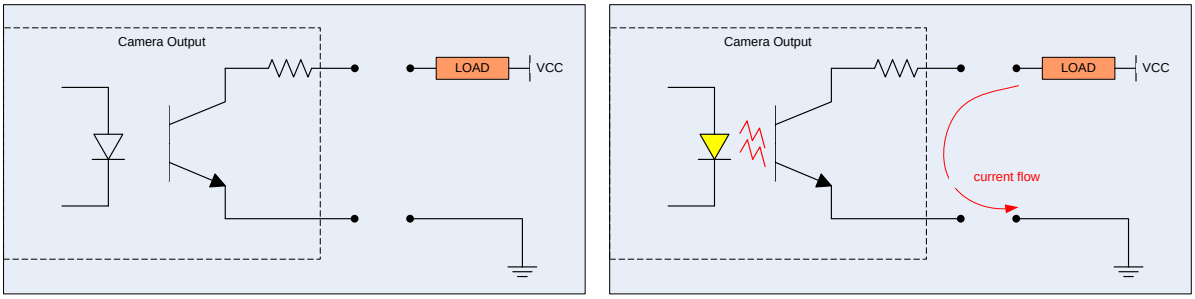
Output Line Details

The general purpose output line signals are connected to I/O lines 3 and 4, which have the following features for control or status indication.

- **Feature set:** LineInverter (RW), outputLineSource (RW), outputLinePulseDelay (RW), outputLinePulseDuration (RW), outputLineValue (RW), outputLineSoftwareCmd (RW), LineSelector (RW), LineName (RO), linePinAssociation (RO), LineFormat (RO), LineMode (RO), LineStatus (RO). See Output Signals Electrical Specifications for more information.
- **External outputs:** Can be used as a strobe signals to control lighting or to generate programmable pulses when specific events are generated by the camera.
- **Output on Events:** Each output can be set independently to one of the available event modes defined by the 'outputLineSource' feature.

Output High and Output Low Block Diagram

Output signal lines when either in the High or Low state are shown in the following figures with an simplified external circuit.

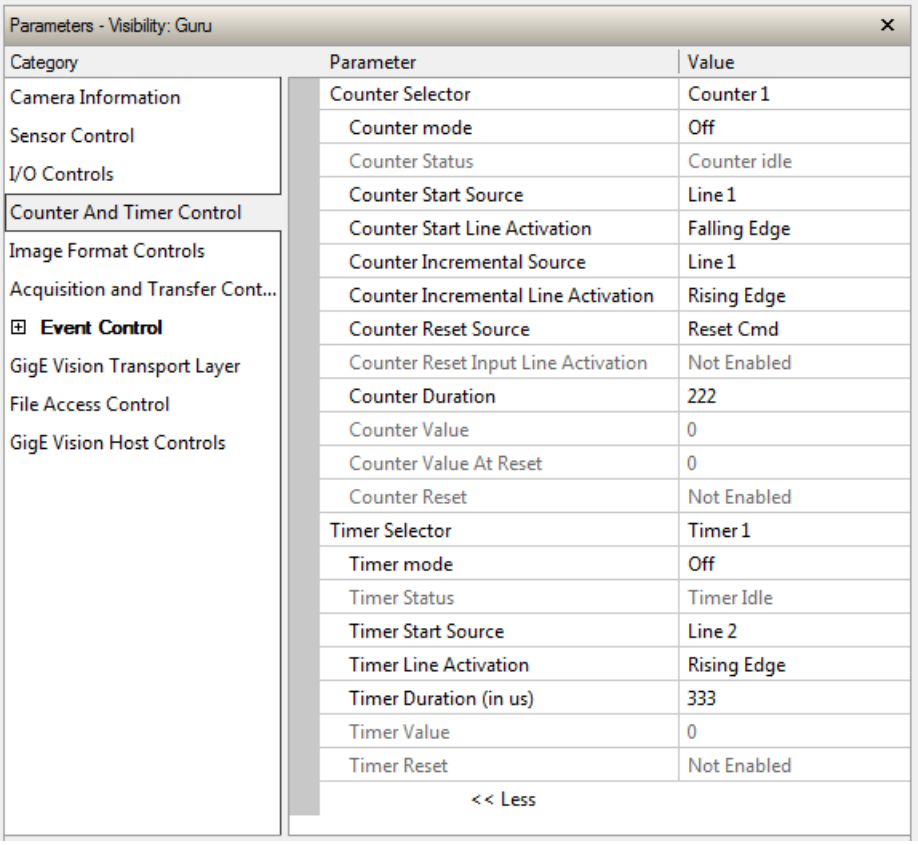


Examples of Logic HI and Logic LO output circuits

Counter and Timer Control Category

The Genie Nano counter and timer controls, as shown by CamExpert, groups parameters used to configure acquisition counters and timers for various input lines and signal edge detection. Parameters in gray are read only, either always or due to another parameter being disabled. Parameters in black are user set in CamExpert or programmable via an imaging application.

Features listed in the description table but tagged as *Invisible* are usually for Teledyne DALSA or third party software usage—not typically needed by end user applications. Also important, Genie Nano cameras are available in a number of models implementing different sensors and image resolutions which may not support the full feature set defined in this category.



Counter and Timer Control Feature Description

The following table and block diagram, describes these parameters along with their view attribute and minimum camera firmware version required. Additionally the Device Version column will indicate which parameter is a member of the DALSA Features Naming Convention (indicated by DFNC), versus the GenICam Standard Features Naming Convention (SFNC tag is not shown).

The Device Version number represents the camera software functional group, not a firmware revision number. As Genie Nano capabilities evolve the device version tag will increase, therefore identifying the supported function package. New features for a major device version release will be indicated by green text for easy identification.

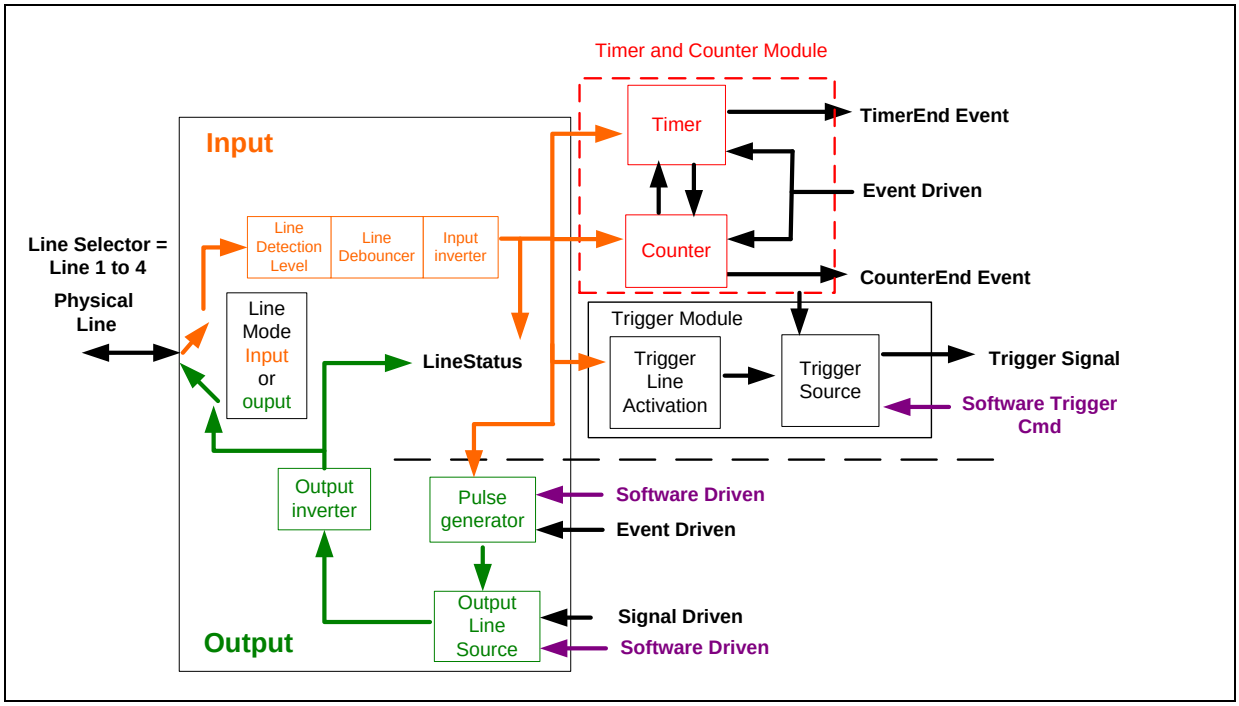
Display Name	Feature & Values	Description	Device Version & View
Counter Selector	counterSelector	Selects the counter to configure.	1.00 Expert DFNC
Counter 1	*Counter1*	*Select counter 1*	
Counter mode	counterMode	Selects the counter mode. The selected Counter is either Active or Disabled. When Disabled, the Counter can be configured.	1.00 Expert DFNC
Off	*Off*	*The selected Counter is Disabled*	
Active	*Active*	*The selected Counter is Enabled*	
Counter Status	counterStatus	Returns the current state of the counter.	1.00 Expert DFNC
Counter Idle	*CounterIdle*	*The counter is idle.* *The counterStartSource feature is set to off.*	
Counter Trigger Wait	*CounterTriggerWait*	*The counter is waiting for a start trigger.*	
Counter Active	*CounterActive*	*The counter is counting for the specified duration.*	
Counter Completed	*CounterCompleted*	*The counter reached the CounterDuration count.*	
Counter Overflow	*CounterOverflow*	*The counter reached its maximum possible count.*	
Counter Start Source	counterStartSource	Select the counter start source. Counter increments from 0 to the value of the counterDuration feature.	1.10 Expert DFNC
Off	*Off*	*Counter is stopped.*	
Acquisition Start	*AcquisitionStart*	*Counter starts on the reception of the Acquisition Start event.*	
Acquisition End	*AcquisitionEnd*	*Counter starts on the reception of the Acquisition End event.*	
Exposure Start	*ExposureStart*	*Counter starts on the reception of the Exposure Start event*	
Exposure End	*ExposureEnd*	*Counter starts on the reception of the Exposure End event.*	
Readout Start	*ReadoutStart*	*Counter starts on the reception of the Readout Start event.*	
Readout End	*ReadoutEnd*	*Counter starts on the reception of the Readout End event.*	
Frame Start	*FrameStart*	*Counter starts on the reception of the Frame Start event.*	
Valid Frame Trigger	*ValidFrameTrigger*	*Counter starts on the reception of the Valid Frame Trigger.*	
Rejected Frame Trigger	*InvalidFrameTrigger*	*Counter starts on the reception of the Invalid Frame Trigger.*	
Line 1	*Line1*	*Counter starts on the specified transitions on Line 1* See Input Signals Electrical Specifications.	
Line 2	*Line2*	*Counter starts on the specified transitions on Line 2*	
Output 1	*Line3*	*Counts the number of transitions (based on the counterIncrementalLineActivation feature setting) of Output 1.*	
Output 2	*Line4*	*Counts the number of transitions (based on the counterIncrementalLineActivation feature setting) of Output 2.*	
Timer 1 End	*Timer1End*	*Counter starts on the reception of the Timer 1 End event.*	
Counter 1 End	*Counter1End*	*Counter starts on the reception of the Counter 1 End event.*	
Counter Start Line Activation	counterStartLineActivation	Selects the activation mode of the input line trigger which starts the counter. This is only applicable when the counterStartSource feature selects a physical Line.	1.00 Expert DFNC
Rising Edge	*RisingEdge*	*Starts counting on rising edge of the selected Line.*	
Falling Edge	*FallingEdge*	*Starts counting on falling edge of the selected Line.*	

Any Edge	*AnyEdge*	*Starts counting on the falling or rising edge of the selected Line.*	
Counter Incremental Source	counterIncrementalSource	Select the event source which increments the counter. The Event Control section provides details and timing diagrams for the supported events.	1.00 Expert DFNC
Off	*Off*	*Counter is stopped.*	
Acquisition Start	*AcquisitionStart*	*Counts the number of Acquisition Start events.*	
Acquisition End	*AcquisitionEnd*	*Counts the number of Acquisition End events.*	
Exposure Start	*ExposureStart*	*Counts the number of Exposure Start events.*	
ExposureEnd	*ExposureEnd*	*Counts the number of Exposure End events.*	
Readout Start	*ReadoutStart*	*Counts the number of Readout Start events.*	
Readout End	*ReadoutEnd*	*Counts the number of Readout End events.*	
Frame Start	*FrameStart*	*Counts the number of Frame Start events.*	
Valid Frame Trigger	*ValidFrameTrigger*	*Counts the number of Valid Frame Triggers.*	
Rejected Frame(s) Trigger	*InvalidFrameTrigger*	*Counts the number of Rejected Frame(s) Trigger.*	
MultiFrame End Trigger	*FrameBurstEnd*	*Counts the number of multi-frame end triggers*	
Line 1	*Line1*	*Counts the number of transitions on Line 1 (based on the counterIncrementalLineActivation feature setting)* See Input Signals Electrical Specifications.	
Line 2	*Line2*	*Counts the number of transitions on Line 2 (based on the counterIncrementalLineActivation feature setting)*	
Output 1	*Line3*	*Counts the number of transitions of Output 1 (based on the counterIncrementalLineActivation feature setting)*	
Output 2	*Line4*	*Counts the number of transitions of Output 2 (based on the counterIncrementalLineActivation feature setting)*	
Internal Clock	*InternalClock*	*The counter increments on each microsecond tick of the device internal Clock.*	
Timer 1 End	*Timer1End*	*Counts the number of Timer 1 End events.*	
Counter Incremental Line Activation	counterIncrementalLineActivation	Selects the counter signal activation mode. The counter increments on the specified signal edge or level.	1.00 Expert DFNC
Rising Edge	*RisingEdge*	*Increment the counter on the rising edge of the selected I/O Line.*	
Falling Edge	*FallingEdge*	*Increment the counter on the falling edge of the selected I/O Line.*	
Any Edge	*AnyEdge*	*Increment the counter on the falling or rising edge of the selected I/O Line.*	
Counter Duration	counterDuration	Sets the duration (or number of events) before the CounterEnd event is generated.	1.00 Expert DFNC
Counter Reset Source	counterResetSource	Selects the signal source to reset the counter. After a reset the counter waits for the next countStartSource signal or event.	1.10 Expert DFNC
Reset Cmd	*Off*	*Reset on reception of the Reset Icommand.*	
Acquisition Start	*AcquisitionStart*	*Reset on reception of the Acquisition Start.*	
Acquisition End	*AcquisitionEnd*	*Reset on reception of the AcquisitionEnd*	
Exposure Start	*ExposureStart*	*Reset on reception of the Exposure Start event.*	
Exposure End	*ExposureEnd*	*Reset on reception of the Exposure End event.*	
Readout Start	*ReadoutStart*	*Reset the counter on the reception of the Readout Start event.*	
Readout End	*ReadoutEnd*	*Reset the counter on the reception of the Readout End event.*	
Frame Trigger	*FrameStart*	*Reset on reception of the Frame Trigger.*	
Valid Frame Trigger	*ValidFrameTrigger*	*Reset on reception of the Valid Frame Trigger.*	
Rejected Frame Trigger	*InvalidFrameTrigger*	*Reset on reception of the Invalid Frame Trigger.*	

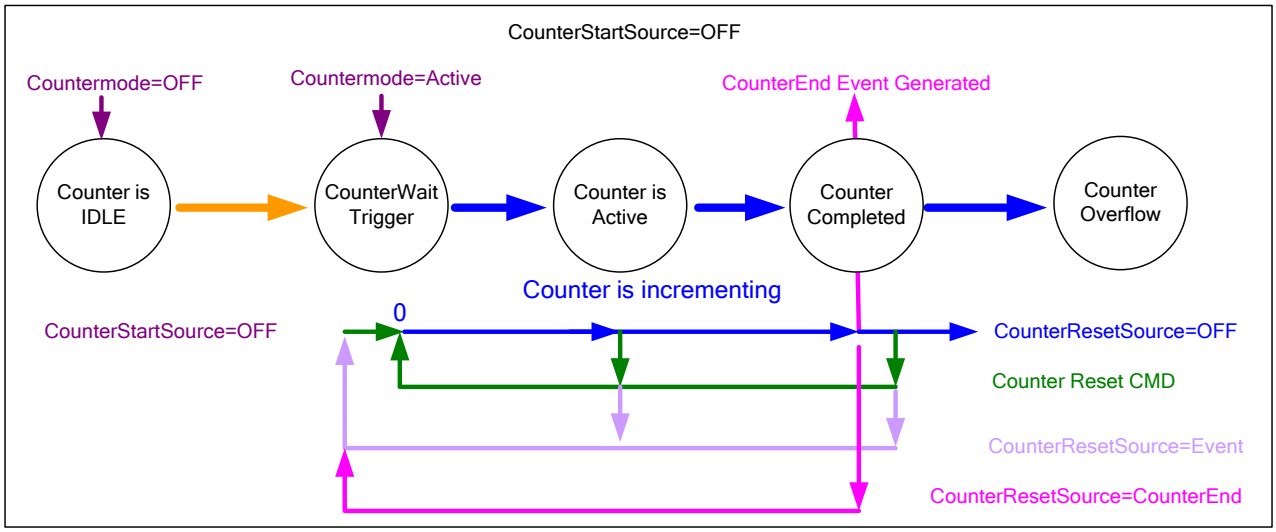
MultiFrame End Trigger	*FrameBurstEnd*	*Reset on reception of the Frame Burst end.*	
Line 1	*Line1*	*Reset counter on the specified transition on line 1.* See Input Signals Electrical Specifications.	
Line 2	*Line2*	*Reset counter on the specified transition on line 2.*	
Output 1	*Line3*	*Counts the number of transitions of Output 1 (based on the counterIncrementalLineActivation feature setting).*	
Output 2	*Line4*	*Counts the number of transitions of Output 2 (based on the counterIncrementalLineActivation feature setting).*	
Timer 1 End	*Timer1End*	*Reset on reception of the Timer End.*	
Counter 1 End	*Counter1End*	*Reset on the reception of the Counter end.*	
Counter Reset Input Line Activation	counterResetLineActivation	Specify the edge transition on the selected line that will reset the selected counter.	1.00 Expert DFNC
Rising Edge	*RisingEdge*	*Reset counter on rising edge of the selected signal.*	
Falling Edge	*FallingEdge*	*Reset counter on falling edge of the selected signal.*	
Any Edge	*AnyEdge*	*Reset counter on the falling or rising edge of the selected signal*	
Counter Value	counterValue	Read the current value of the selected counter.	1.00 Expert DFNC
Counter Value At Reset	counterValueAtReset	Reads the value of the selected counter when it was reset by a trigger or by an explicit Counter Reset command.	1.00 Expert DFNC
Counter Reset	counterReset	Resets the selected counter to zero. The counter starts immediately after the reset. To temporarily disable the counter, set the Counter Event Source feature to Off.	1.00 Expert DFNC
Timer Selector	timerSelector	Selects which timer to configure.	1.00 Expert DFNC
Timer 1	*Timer1*	*Timer 1 selected*	
Timer Mode	timerMode	Select the Timer mode. The selected Timer is Active or Disabled. When Disabled, the Timer can be configured.	1.00 Expert DFNC
Off	*Off*	*The selected Timer is Disabled.*	
Active	*Active*	*The selected Timer is Enabled.*	
Timer Status	timerStatus	Returns the current state of the timer.	1.00 Expert DFNC
Timer Idle	*TimerIdle*	*The timer is idle. The CounterStartSource feature is set to off.*	
Timer Trigger Wait	*TimerTriggerWait*	*The timer is waiting for a start trigger.*	
Timer Active	*TimerActive*	*The timer is counting for the specified duration.*	
Timer Completed	*TimerCompleted*	*The timer reached the TimerDuration count.*	
Timer Start Source	timerStartSource	Select the trigger source to start the timer. The Event Control section provides details and timing diagrams for the supported events.	1.00 Expert DFNC
TimerReset Cmd	*Off*	*Starts with the reception of the TimerReset Icommand.*	
Acquisition Start	*AcquisitionStart*	*Start Timer on Acquisition Start event.*	
Acquisition End	*AcquisitionEnd*	*Start Timer on Acquisition End event*	
Exposure Start	*ExposureStart*	*Start Timer on Exposure Start event.*	
Exposure End	*ExposureEnd*	*Start Timer on Exposure End event.*	
Readout Start	*ReadoutEnd*	*Start Timer on Readout Start event.*	
Readout End	*ReadoutStart*	*Start Timer on Readout End event.*	
Frame Start	*FrameStart*	*Start Timer on Frame Start event.*	
Frame Trigger	*ValidFrameTrigger*	*Start Timer on Frame Trigger event.*	
Frame Burst End	*FrameBurstEnd*	*Start Timer on Frame Burst End event.*	

Line 1	*Line1*	*Start Timer on a transition of I/O Line 1 event.* See Input Signals Electrical Specifications.	
Line 2	*Line2*	*Start Timer on a transition of I/O Line 2 event.*	
Timer 1 End	*Timer1End*	*Start Timer on Timer End event.*	
Counter 1 End	*Counter1End*	*Start Timer on Counter 1 End event.*	
Timer Line Activation	timerStartLineActivation	Select the trigger activation mode which starts the timer.	1.00 Expert DFNC
Rising Edge	*RisingEdge*	*Starts counter on rising edge of the selected signal.*	
Falling Edge	*FallingEdge*	*Starts counter on falling edge of the selected signal.*	
Any Edge	*AnyEdge*	*Starts counter on the falling or rising edge of the selected signal.*	
Timer Duration	timerDuration	Sets the duration (in microseconds) of the timer pulse.	1.00 Expert DFNC
Timer Value	timerValue	Reads the current value (in microseconds) of the selected timer.	1.00 Expert DFNC
Timer Reset	timerReset	Resets the timer to 0 while *timerStatus=TimerActive*. Timer then waits for the next *timerStartSource* event.	1.00 Expert DFNC

Counter and Timer Group Block Diagram

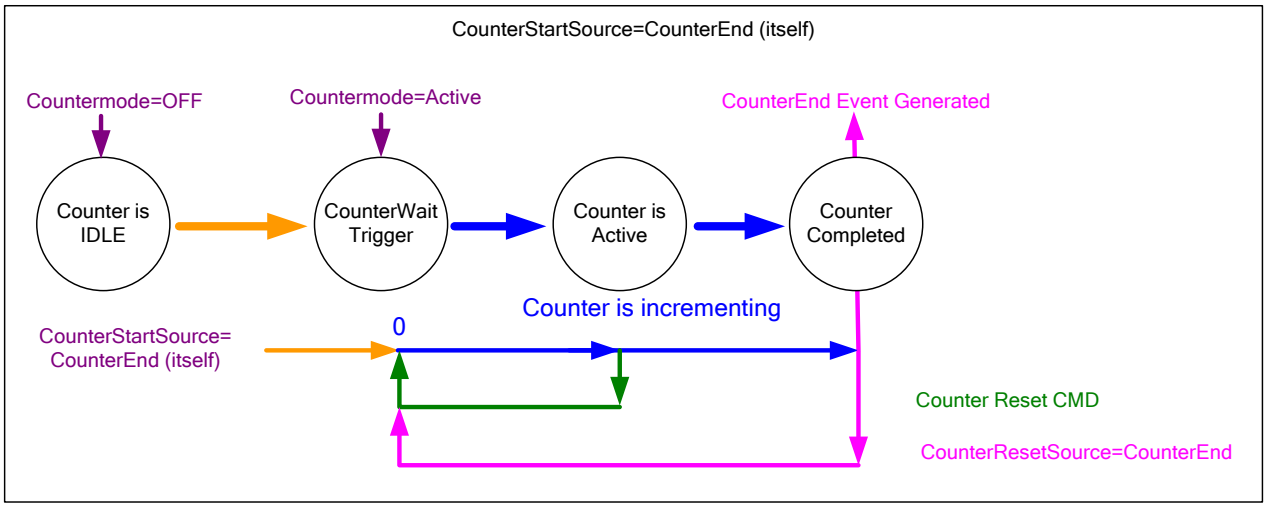


Example: Counter Start Source = OFF



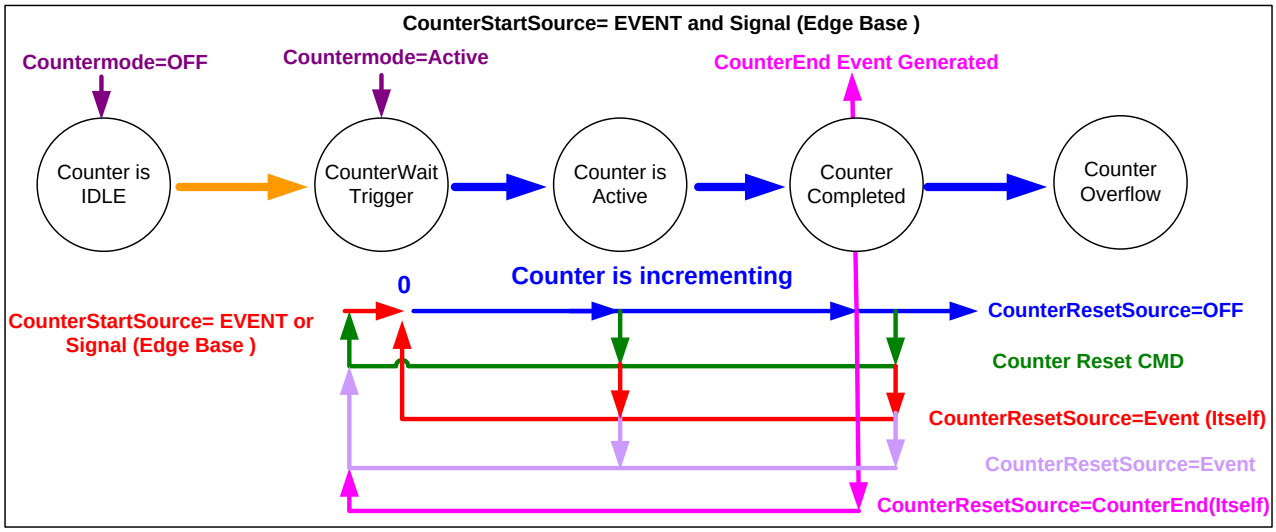
- The counter starts on the **counterReset Cmd**.
- The counter continues unless a new **counterReset Cmd** is received, which then restarts the counter at 00.
- When **Counter Reset Source= 'Event' or 'CounterEnd**' the counter is reset to 00 but does not restart counting, until the next **CounterReset Cmd**.

Example: Counter Start Source = CounterEnd (itself)



- Counter starts when Counter Mode is set to Active.
- A **Counter Reset CMD** will reset the counter to 00 and it then continues counting.
- **counterResetSource** must be set to **CounterEnd**. When the counterValue feature reaches the counterDuration value an event is generated and the counter is reset to 00, then continues.

Example: CounterStartSource = EVENT and Signal (Edge Base)



Example: CounterStartSource = Line (Edge Base) Example

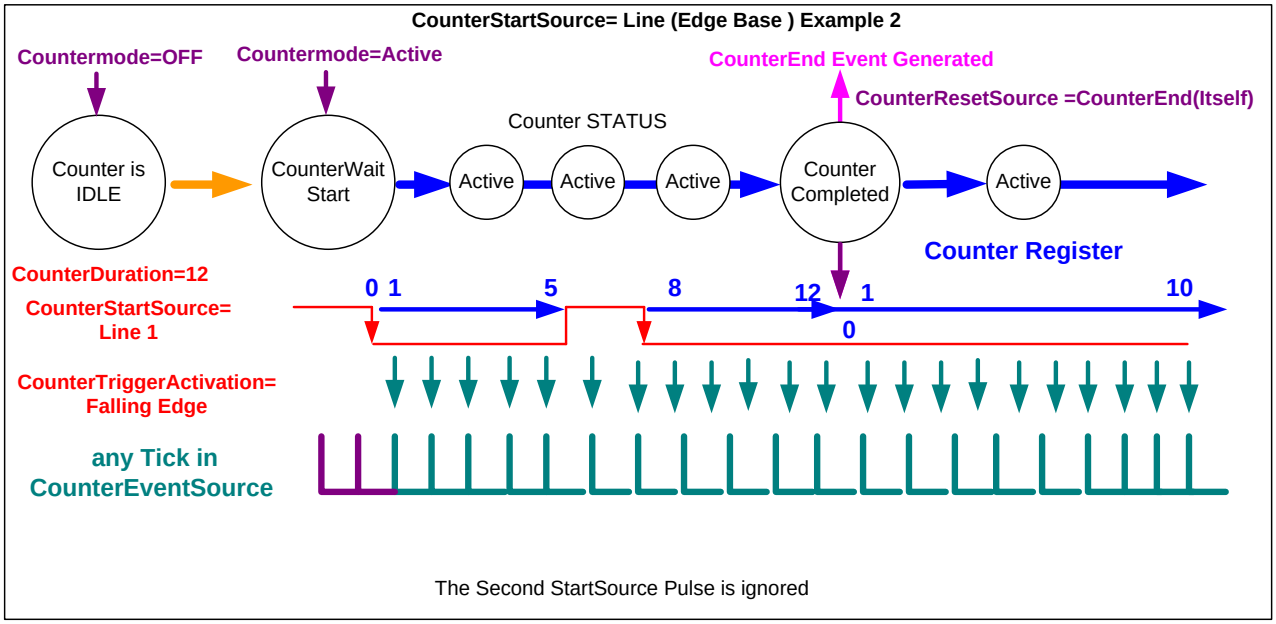


Image Format Control Category

The Genie Nano Image Format controls, as shown by CamExpert, groups parameters used to configure camera pixel format, image cropping, and multiple ROI. Additionally a feature control to select and output a Genie Nano internal test image simplifies qualifying a camera setup without a lens.

Parameters in gray are read only, either always or due to another parameter being disabled. Parameters in black are user set in CamExpert or programmable via an imaging application.

Features listed in the description table but tagged as *Invisible* are usually for Teledyne DALSA or third party software usage—not typically needed by end user applications. Also important, Genie Nano cameras are available in a number of models implementing different sensors and image resolutions which may not support the full feature set defined in this category.

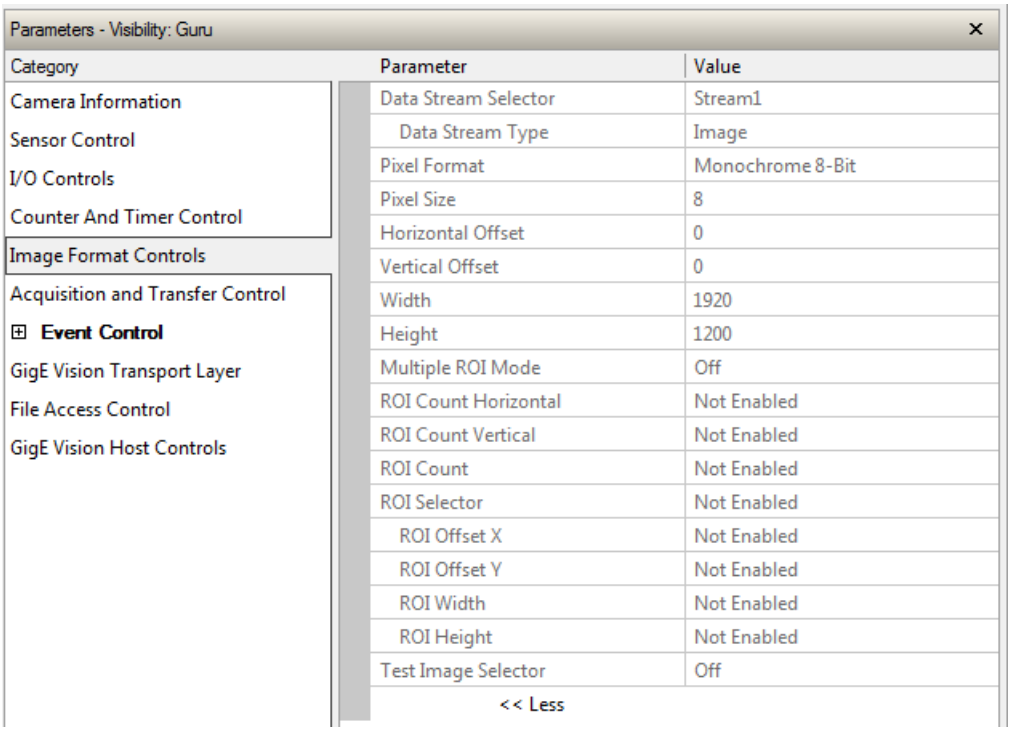


Image Format Control Feature Description

The following table describes these features along with their view attribute and device framework version. For each feature the device version may differ for each camera sensor available. Such differences will be clearly indicated for any applicable feature.

When a Device Version number is indicated, this represents the camera software functional group, not a firmware revision number. As Genie Nano capabilities evolve the device version will increase, therefore identifying the supported function package. New features for a major device version release will be indicated by green text for easy identification.

The first column indicates whether a feature applies to monochrome or color camera models via a symbol. No symbol indicates a common feature. Additionally the description column will indicate which feature is a member of the DALSA Features Naming Convention (denoted by DFNC), versus the GenICam Standard Features Naming Convention (SFNC tag is not shown).

B/W Color	Display Name	Feature & Values	Description
	Data Stream Selector	dataStreamSelector	Select which data stream to control (default is Stream 1) < RO, Beginner, DFNC >
	Stream1	*Stream1*	*Adjust parameters for Stream1.*
	Data Stream Type	dataStreamType	This feature is used to retrieve the transfer protocol used to stream blocks. < RO, Beginner, DFNC >
	Image	*Image*	*The Image data blocks are streamed using the payload type "Image".*
	Pixel Format	PixelFormat	Format of the pixel provided by the device. Contains all format information as provided by PixelCoding, PixelSize, PixelColorFilter, combined in one single value. < Beginner >
	*Monochrome 8-Bit*	*Mono8*	*Mono8: Monochrome 8-Bit*
	*Monochrome 10-Bit*	*Mono10*	*Mono10: Monochrome 10-Bit*
	*Monochrome 12-Bit*	*Mono12*	*Mono12: Monochrome 12-Bit*
	*BayerRG 8-Bit*	*BayerRG8*	*Color camera: BayerRG 8-Bit*
	*BayerRG 10-Bit*	*BayerRG10*	*Color camera: BayerRG 10-Bit*
	*BayerRG 12-Bit*	*BayerRG12*	*Color camera: BayerRG 12-Bit*
	Pixel Size	PixelSize	Total size in bits of an image pixel. < RO, Guru >
	8 Bits/Pixel	*Bpp8*	*Bpp8: 8 bits per pixel*
	10 Bits/Pixel	*Bpp10*	*Bpp10: 10 bits per pixel*
	12 Bits/Pixel	*Bpp12*	*Bpp12: 12 bits per pixel*
	Horizontal Offset	OffsetX	Horizontal offset from the Sensor Origin to the Area Of Interest (in pixels). < Beginner >

	Vertical Offset	OffsetY	Vertical offset from the Sensor Origin to the Area Of Interest (in Lines). < Beginner >
	Width	Width	Width of the Image provided by the device (in pixels). < Beginner >
	Height	Height	Height of the Image provided by the device (in lines). < Beginner >
	Multiple ROI Mode	multipleROIMode	Enable the Multiple ROI (Region of Interest) per image feature. The ROI Count is set by the Multiple ROI Count feature. < Expert, DFNC >
	Off	*Off*	*Single ROI per image.*
	Active	*Active*	*The ROI per image feature is active.*
	ROI Count Horizontal	multipleROICountHorizontal	Specifies the number of ROI (Region of Interest) available for the X axis. < Expert, DFNC >
	ROI Count Vertical	multipleROICountVertical	Specifies the number of ROI (Region of Interest) available for the Y axis. < Expert, DFNC >
	ROI Count	multipleROICount	Specifies the number of possible ROI (Region of Interest) available in an acquired image. One is minimum, while the maximum is device specific. < Expert, DFNC, RO >
	ROI Selector	multipleROISelector	Select an ROI (Region of Interest) when Multiple ROI Mode is enabled. Selector range is from 1 to the Multiple ROI Count value. < Expert, DFNC >
	ROI (x1, y1)	*roi1_1*	*ROI (x1, y1)*
	ROI (x2, y1)	*roi2_1*	*ROI (x2, y1)*
	ROI (x3, y1)	*roi3_1*	*ROI (x3, y1)*
	ROI (x4, y1)	*roi4_1*	*ROI (x4, y1)*
	ROI (x1, y2)	*roi1_2*	*ROI (x1, y2)*
	ROI (x2, y2)	*roi2_2*	*ROI (x2, y2)*
	ROI (x3, y2)	*roi3_2*	*ROI (x3, y2)*
	ROI (x4, y2)	*roi4_2*	*ROI (x4, y2)*
	ROI (x1, y3)	*roi1_3*	*ROI (x1, y3)*
	ROI (x2, y3)	*roi2_3*	*ROI (x2, y3)*
	ROI (x3, y3)	*roi3_3*	*ROI (x3, y3)*
	ROI (x4, y3)	*roi4_3*	*ROI (x4, y3)*
	ROI (x1, y4)	*roi1_4*	*ROI (x1, y4)*
	ROI (x2, y4)	*roi2_4*	*ROI (x2, y4)*
	ROI (x3, y4)	*roi3_4*	*ROI (x3, y4)*
	ROI (x4, y4)	*roi4_4*	*ROI (x4, y4)*
	ROI Offset X	multipleROIOffsetX	Horizontal offset (in pixels) from the origin to the selected ROI (Region of Interest). < Expert, DFNC >
	ROI Offset Y	multipleROIOffsetY	Vertical offset (in pixels) from the origin to the selected ROI (Region of Interest). < Expert, DFNC >

	ROI Width	multipleROIWidth	Width of the selected ROI (Region of Interest) provided by the device (in pixels). < Expert, DFNC >
	ROI Height	multipleROIHeight	Height of the selected ROI (Region of Interest) provided by the device (in pixels). < Expert, DFNC >
	Test Image Selector	TestImageSelector	Selects the type of test image generated by the camera. < Beginner >
	Off	*Off*	*Image is from the camera sensor.*
	Grey Horizontal Ramp	*GreyHorizontalRamp*	*Image is filled horizontally with an image that goes from the darkest possible value to the brightest.*
	Grey Vertical Ramp	*GreyVerticalRamp*	*Image is filled vertically with an image that goes from the darkest possible value to the brightest.*
	Grey Diagonal Ramp Moving	*GreyDiagonalRampMoving*	*Image is filled horizontally with an image that goes from the darkest possible value to the brightest by 1 Dn increment per pixel and that moves horizontally.*
	Width Max	WidthMax	The maximum image width is the dimension calculated after horizontal binning, decimation or any other function changing the horizontal dimension of the image. < RO, Invisible >
	Height Max	HeightMax	The maximum image height is the dimension calculated after vertical binning, decimation or any other function changing the vertical dimension of the image. < RO, Invisible >
	Pixel Coding	PixelCoding	Output image pixel coding format of the sensor. < RO, Invisible >
	*Mono*	*Mono*	*Pixel is monochrome*
	*MonoSigned*	*MonoSigned*	*Pixel is monochrome and signed*
	*MonoPacked*	*MonoPacked*	*Pixel is monochrome and packed*
	*Raw Bayer*	*Raw*	*Pixel is raw Bayer*
	Pixel Color Filter	PixelColorFilter	Indicates the type of color filter applied to the image. < RO, Invisible >
	None	*None*	*No filter applied on the sensor.*
	Bayer GR	*BayerGR*	*For BayerGR, the 2x2 mosaic alignment is GR/BG.*
	Bayer RG	*BayerRG*	*For BayerRG, the 2x2 mosaic alignment is RG/GB.*
	Bayer GB	*BayerGB*	*For BayerGB, the 2x2 mosaic alignment is GB/RG.*
	Bayer BG	*BayerBG*	*For BayerBG, the 2x2 mosaic alignment is BG/GR.*

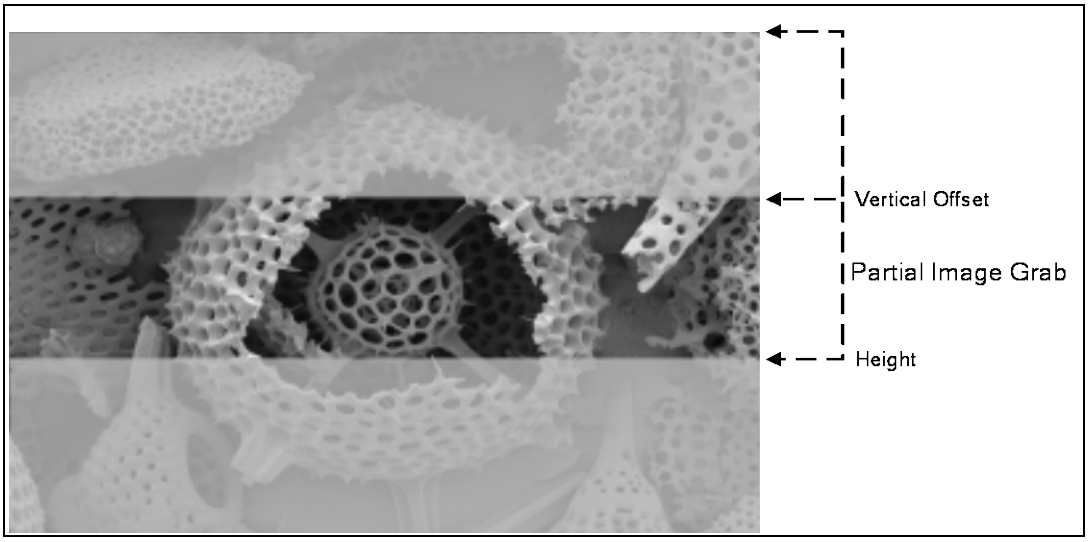
Width and Height Features for Partial Scan Control

Width and Height controls along with their respective offsets, allow the Genie Nano to grab a region of interest (ROI) within the full image frame. Besides eliminating post acquisition image cropping done by software in the host computer, a windowed ROI grab reduces the bandwidth required on the Gigabit Ethernet link since less pixels are transmitted.

Vertical Cropping (Partial Scan)

The Height and Vertical Offset features, used for vertical cropping, reduce the number of video lines grabbed for a frame. By not scanning the full height of the sensor, the maximum possible acquisition frame rate is proportionately increased, up to the Genie Nano model maximum.

The following figure is an example of a partial scan acquisition using both Height and Vertical Offset controls. The Vertical Offset feature defines at what line number from the sensor origin to acquire the image. The Height feature defines the number of lines to acquire (to a maximum of the remaining frame height). Note that only the partial scan image (ROI) is transmitted to the host computer.



Partial Scan Illustration

Note: In general, using short exposures at high frame rates will exceed the maximum bandwidth to host transfer speed, when the camera buffer memory is filled. The tables below (for different Genie Nano models) describes frame rate maximums written to internal memory, that can be sustained during continuous acquisition. Increase the exposure time, decrease the frame rate, enable TurboDrive, or acquire a limited number of frames, so as to not exceed the transfer bandwidth.

Maximum Frame Rate (fps) Examples

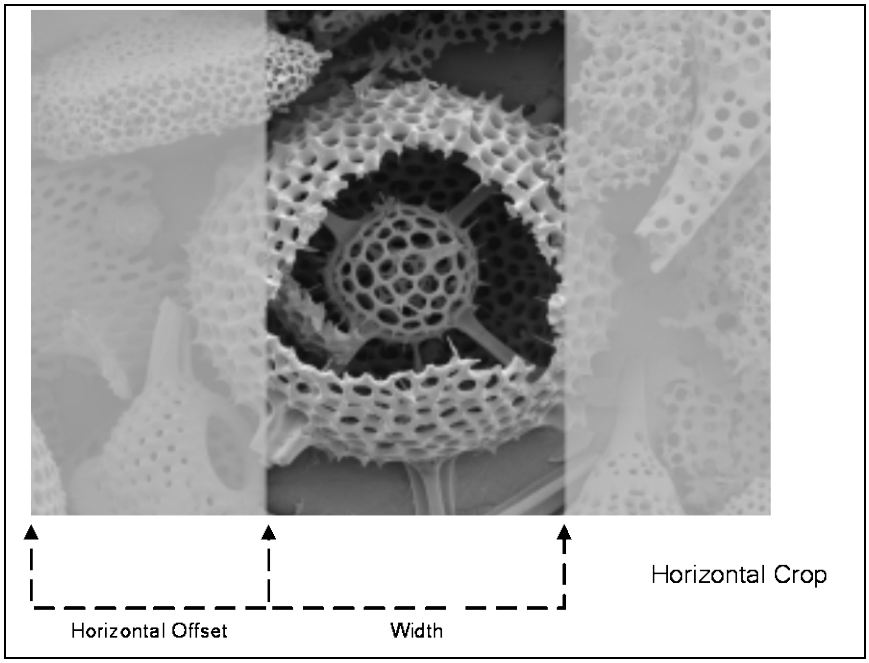
Vertical Lines Acquired	Free Running Acquisition M/C1920 Models (minimum exposure)	Free Running Acquisition M/C1940 Models (minimum exposure)
1216	38 fps	83
1080	43 fps	94
900	51 fps	111
600	75 fps	163
450	98 fps	212
300	141 fps	304
150	249 fps	539
74	409 fps	884
32	632 fps	1366
16	799 fps	1724

Note: Maximum frame rate values are based on zero vertical offset (limited to firmware 1.00).

Horizontal Cropping (Partial Scan)

Genie Nano supports cropping the acquisition horizontally by grabbing less pixels on each horizontal line. Horizontal offset defines the start of the acquired video line while horizontal width defines the number of pixels per line. Horizontal control features have the following independent constants:

- Horizontal Offset is limited to pixel increment values of 4 to define the start of the video line.
- Horizontal Width decrements from maximum in pixel counts of 8 (i.e. the video width is in steps of 8 pixels).



Using the Multiple ROI Mode

Genie Nano monochrome cameras implement the Multiple ROI mode (region of interest) features, which allow having 2 to 16 smaller image ROI areas versus the single ROI area possible with vertical and horizontal crop functions.

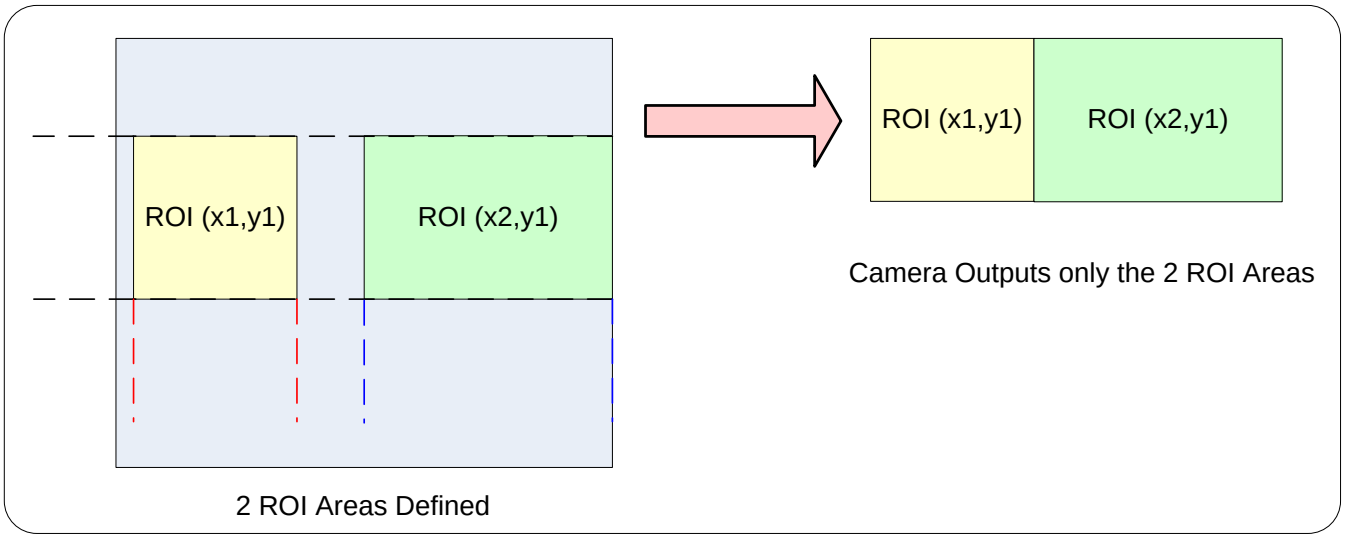
These multiple areas are combined as one output image, reducing transfer bandwidth requirements, plus with the added benefit that any reduction of the number of vertical lines output will result in a greater possible camera frame rate. This increased frame rate increase (written to internal memory) is similar to using the vertical crop feature.

Important Usage Details

- Two to 16 ROI areas are supported by the Genie Nano (4x4 matrix maximum).
- For any selected ROI, the Offset X/Offset Y features define the upper left corner of the ROI.
- Offset, Width, and Height features have individual increment values (step size) to consider.
- The first ROI of any row sets the “height value” for any other ROI in that row.
- The first ROI of any column sets the “width value” of any other ROI in that column.

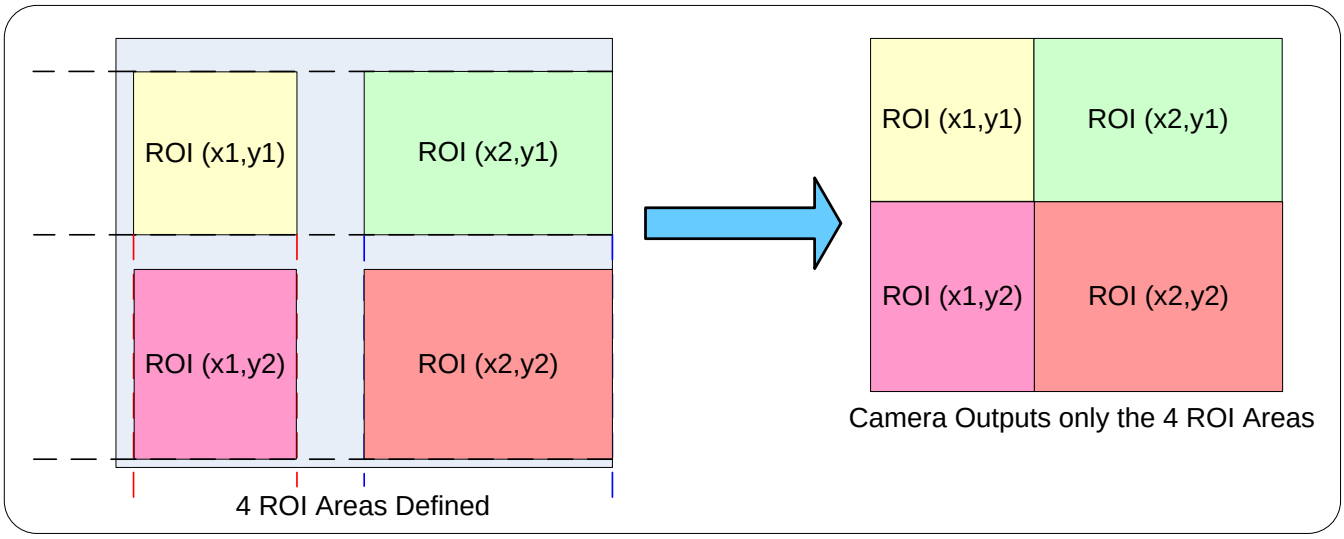
The following graphics show examples of the multi-ROI function (2x1 and 2x2 areas), the resultant camera output, and the constraints when configuring the ROI areas.

Example: Two Horizontal ROI Areas (2x1)



- Note that ROI(x1,y1) defines the height of any ROI in that row.
- ROI(x2,y1) can have a different width.
- The camera output image frame consists only of the two ROI areas. The user must account for the change between ROI data for each output image row.
- The output image being smaller, reduces the bandwidth requirements.

Example: Four ROI Areas (2x2)

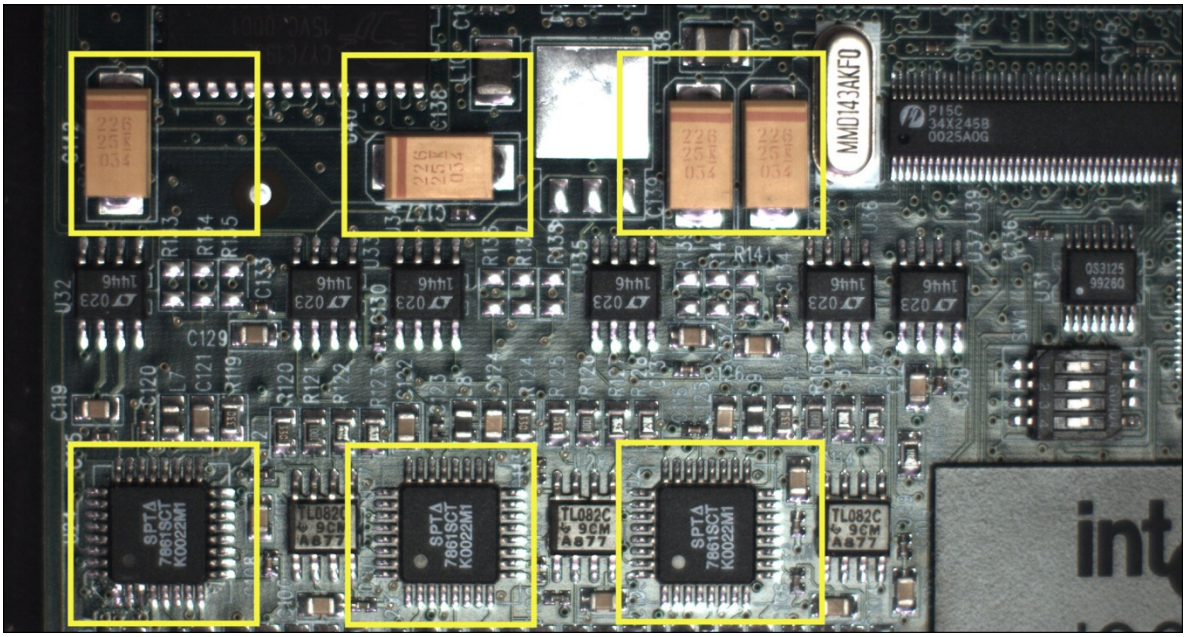


- Note that ROI(x1,y1) defines the height of any ROI in that row.
- ROI(x2,y1) can have a different width.
- ROI(x1,y2) can have a different height relative to ROI(x1,y1).
- The camera output image frame consists only of the ROI areas, in the same order as the ROI rows and columns. The user must account for the change between ROI data for each output image row.
- The output image being smaller, reduces the bandwidth requirements.

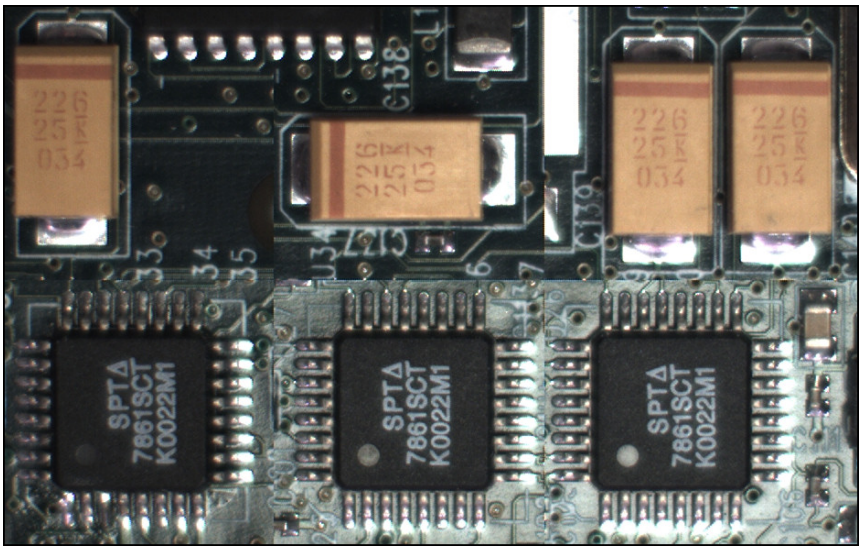
Example: Actual Sample with Six ROI Areas (3x2)

This example uses the example problem of solder inspection of certain components on a PCB. The image below of a sample PCB shows 6 ROI areas highlighted by the yellow overlay graphics (manually added to this example).

Note how the top row ROI areas may be larger than ideal due to height and width requirements of ROI areas in the second row; constraints and interdependencies as defined in the preceding ROI descriptions.



With the ROI areas defined, the camera outputs an image consisting only of data within those ROI areas, as shown below. Such data reduction improves transfer bandwidth and also reduces image processing time for the host system imaging application.



Internal Test Pattern Generator

The Genie Nano camera includes a number of internal test patterns which easily confirm camera installations, without the need for a camera lens or proper lighting.

Use CamExpert to easily enable and select the any of the Nano test patterns from the drop menu while the camera is not in acquisition mode. Select live grab to see the pattern output.

Note that internal test patterns are generated by the camera FPGA, thus are identical for monochrome or color camera models.

The Nano Test Patterns are:

- **Grey Horizontal ramp**: *Image is filled horizontally with an image that goes from the darkest possible value to the brightest.*

- **Grey Vertical ramp**: *Image is filled vertically with an image that goes from the darkest possible value to the brightest.*

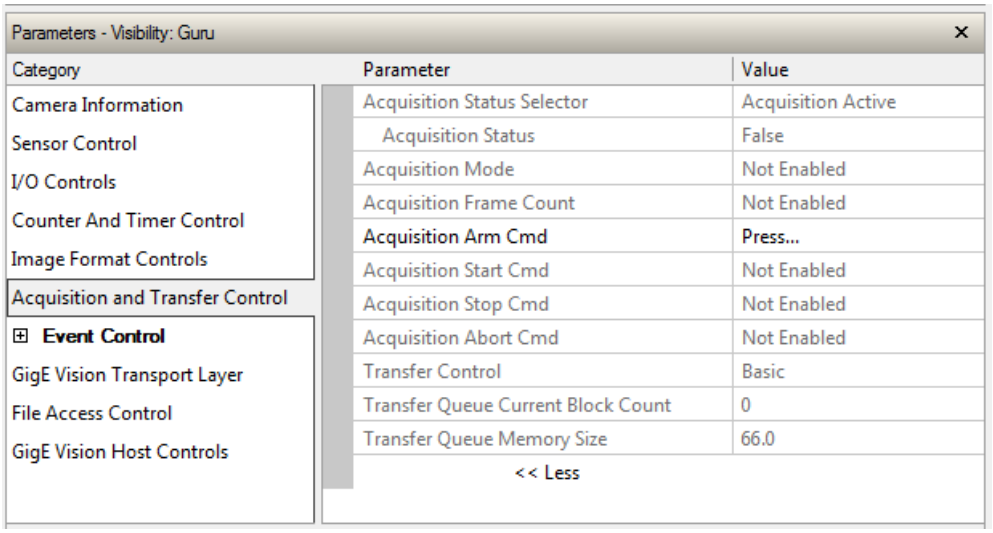
- **Grey Diagonal Ramp Moving**: combination of the 2 previous schemes, but first pixel in image is incremented by 1 between successive frames. This is a good pattern to indicate motion when doing a continuous grab.

Acquisition and Transfer Control Category

The Genie Nano Acquisition and Transfer controls, as shown by CamExpert, groups parameters used to configure the optional acquisition modes of the device.

Parameters in gray are read only, either always or due to another parameter being disabled. Parameters in black are user set in CamExpert or programmable via an imaging application.

Features listed in the description table but tagged as *Invisible* are usually for Teledyne DALSA or third party software usage—not typically needed by end user applications. Also important, Genie Nano cameras are available in a number of models implementing different sensors and image resolutions which may not support the full feature set defined in this category.



Acquisition and Transfer Control Feature Descriptions

The following table describes these parameters along with their view attribute and minimum camera firmware version required. Additionally the Device Version column will indicate which parameter is a member of the DALSA Features Naming Convention (denoted by DFNC), versus the GenICam Standard Features Naming Convention (SFNC tag is not shown).

The Device Version number represents the camera software functional group, not a firmware revision number. As Genie Nano capabilities evolve the device version tag will increase, therefore identifying the supported function package. New features for a major device version release will be indicated by green text for easy identification.

Display Name	Feature & Values	Description	Device Version & View
Acquisition Status Selector	AcquisitionStatusSelector	Selects the internal acquisition signal to read using AcquisitionStatus.	1.00 Expert
Acquisition Active	*AcquisitionActive*	*Device is currently doing an acquisition of one or many frames.*	
Acquisition Status	AcquisitionStatus	Reads the state of the internal acquisition signal selected using the Acquisition Status Selector feature.	1.00 Expert
Acquisition Mode	AcquisitionMode	Set the acquisition mode of the device. It defines the number of frames to capture during an acquisition and the way the acquisition stops.	1.00 Beginner

Single Frame	*SingleFrame*	*One frame is captured for each AcquisitionStart Command. An AcquisitionStop occurs at the end of the Active Frame.*	
Multi-Frame	*MultiFrame*	*A sequence of frames is captured for each AcquisitionStart Command. The number of frames is specified by AcquisitionFrameCount feature. An AcquisitionStop occurs at the end of the Active Frame(s)*	
Continuous	*Continuous*	*Frames are captured continuously with AcquisitionStart until stopped with the AcquisitionStop command.*	
Acquisition Frame Count	AcquisitionFrameCount	Number of frames to be acquired in MultiFrame acquisition mode.	1.00 Beginner
Acquisition Arm Cmd	AcquisitionArm	Arms the device before an AcquisitionStart command. This optional command validates all the current features for consistency and prepares the device for a fast start of the acquisition. If not used explicitly, this command is automatically executed at the first AcquisitionStart but will not be repeated for subsequent ones unless a data transfer related feature is changed in the device.	1.00 Guru
Acquisition Start Cmd	AcquisitionStart	Start image capture using the currently selected acquisition mode. The number of frames captured is specified by AcquisitionMode feature.	1.00 Beginner
Acquisition Stop Cmd	AcquisitionStop	Stops the Acquisition of the device at the end of the current frame unless the triggerFrameCount feature is greater than 1. (WO)	1.00 Beginner
Acquisition Abort Cmd	AcquisitionAbort	Aborts the acquisition immediately. This will end the capture without completing the current Frame or aborts waiting on a trigger. If no acquisition is in progress, the command is ignored.	1.00 Beginner
Transfer Control	TransferControlMode	Sets the method used to control the transfer.	1.00 Expert
Basic	*Basic*	*Basic mode ensures maximum compatibility but does not allow for control of the transfer flow.*	
User Controlled	*UserControlled*	*Manual mode allows maximum control of the transfer flow.*	
Transfer Queue Current Block Count	transferQueueCurrentBlockCount	Returns the current number of blocks in the transfer queue.	1.00 DFNC Expert
Transfer Queue Memory Size	transferQueueMemorySize	Indicates the amount of device memory (in MBytes) available for internal image frame accumulation in the transfer queue. Increasing or decreasing memory reserved by devicePacketResendBufferSize will affect total memory available here.	1.00 DFNC Expert
Device Registers Streaming Start	DeviceRegistersStreamingStart	Announces the start of registers streaming without immediate checking for consistency.	1.00 Invisible
Device Registers Streaming End	DeviceRegistersStreamingEnd	Announces end of registers streaming and performs validation for registers consistency before activating them.	1.00 Invisible
Device Feature Streaming Start	DeviceFeaturePersistenceStart	Announces the start of feature streaming without immediate checking for consistency.	1.00 Invisible
Device Feature Streaming End	DeviceFeaturePersistenceEnd	Announces end of feature streaming and performs validation for feature consistency before activating them.	1.00 Invisible
Register Check	DeviceRegistersCheck	Performs an explicit register set validation for consistency.	1.00 Invisible
Registers Valid	DeviceRegistersValid	States if the current register set is valid and consistent.	1.00 Invisible

Acquisition Buffering

All acquisitions are internally buffered and transferred as fast as possible to the host system. This internal buffer allows uninterrupted acquisitions no matter of any transfer delays that might occur (such as acquisition frame rates faster that the Gigabit Ethernet link or the IEEE Pause frame). Only when the internal buffer is consumed would an Image Lost Event be generated.

Using Transfer Queue Current Block Count with CamExpert

This feature returns the number of frames buffered within the Genie Nano pending transfer to the host system. Image frames are buffered in cases where the host system is temporarily busy or cases of high network traffic with other devices through the same Ethernet switch. By buffering image frames, the Genie Nano will not need to drop frames when there are temporary delays to the transfer.

When using CamExpert, right click on this field and then click on Refresh from the pop-up menu. The current frame count in the transfer buffer is displayed in the *Value* field. During live grab, if the number of frames in the transfer buffer is increasing, then there is a problem with the network or host bandwidth being exceeded. The ImageLost event occurs when all buffer space is consumed.

Features that Cannot be Changed During a Transfer

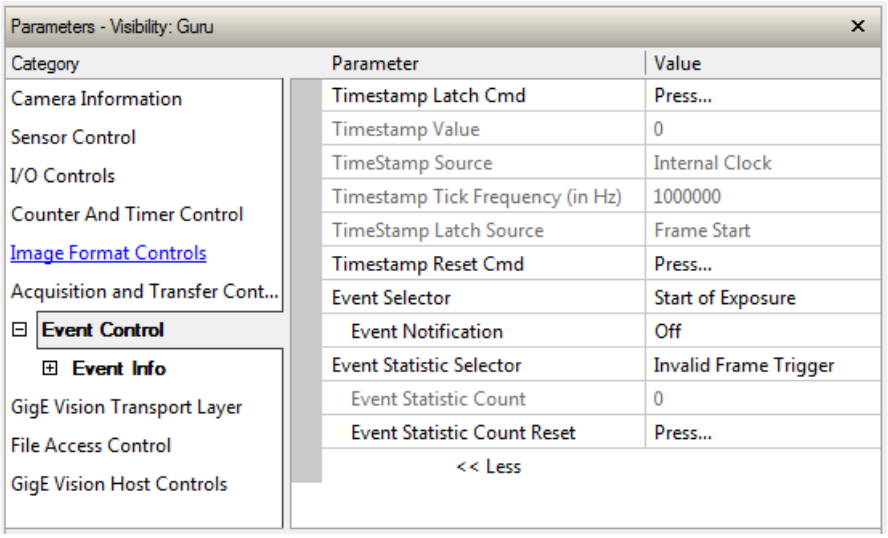
The following features cannot be changed during an acquisition or when a transfer is connected.

Feature Group	Features Locked During a Sapera Transfer
CAMERA INFORMATION	UserSetLoad
SENSOR CONTROL	*NA*
I/O CONTROL	*NA*
COUNTER AND TIMER CONTROL	*NA*
IMAGE FORMAT CONTROL	PixelFormat OffsetX OffsetY Width Height Multi-ROI
ACQUISITION AND TRANSFER CONTROL	DeviceRegistersStreamingStart DeviceRegistersStreamingEnd
EVENT CONTROL	*NA*
GIGE VISION TRANSPORT LAYER CONTROL	GevSCPSPacketSize
GIGE VISION HOST CONTROL	InterPacketTimeout InterPacketTimeoutRaw ImageTimeout
FILE ACCESS CONTROL	*NA*

Event Control Category

The Genie Nano Event control, as shown by CamExpert, groups parameters used to configure Camera Event related features. Parameters in gray are read only, either always or due to another parameter being disabled. Parameters in black are user set in CamExpert or programmable via an imaging application.

Features listed in the description table but tagged as *Invisible* are usually for Teledyne DALSA or third party software usage—not typically needed by end user applications. Also important, Genie Nano cameras are available in a number of models implementing different sensors and image resolutions which may not support the full feature set defined in this category.



Event Control Feature Descriptions

The following table describes these parameters along with their view attribute and minimum camera firmware version required. Additionally the Device Version column will indicate which parameter is a member of the DALSA Features Naming Convention (denoted by DFNC), versus the GenICam Standard Features Naming Convention (SFNC tag is not shown).

The Device Version number represents the camera software functional group, not a firmware revision number. As Genie Nano capabilities evolve the device version tag will increase, therefore identifying the supported function package. New features for a major device version release will be indicated by green text for easy identification.

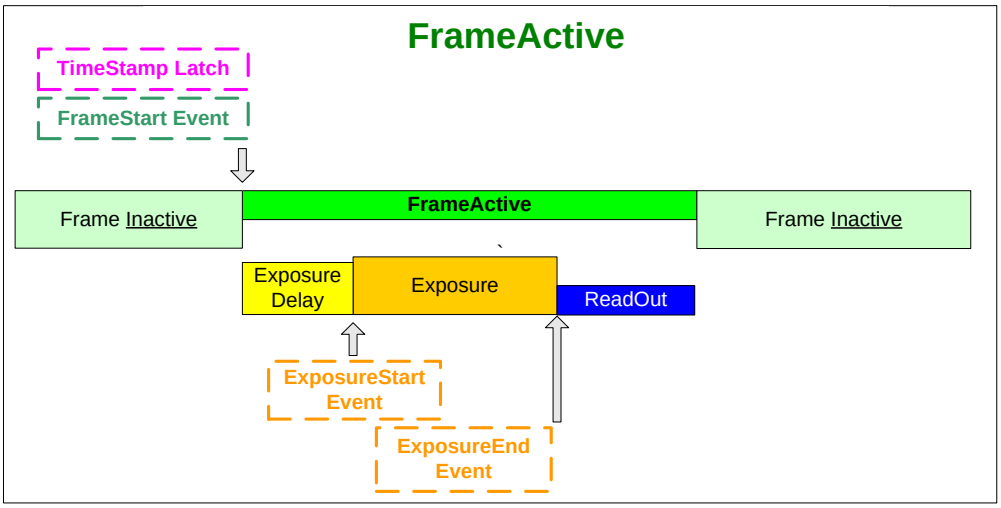
Display Name	Feature & Values	Description	Device Version & View
Timestamp Latch Cmd	timestampControlLatch	Latch the current timestamp internal counter value in the timestampValue feature.	1.00 Expert DFNC
Timestamp Value	timestampValue	Returns the 64-bit value of the timestamp counter.	1.00 Expert DFNC
TimeStamp Source	timestampSource	Specifies the source used as the incrementing signal for the Timestamp register.	1.00 Expert DFNC
Internal Clock	*InternalClock*	*The timestamp source is generated by the camera internal clock. Refer to the timestampTickFrequency feature for the time base.*	
Timestamp Tick Frequency	timestampTickFrequency	Indicates the number of timestamp ticks (or increments) during 1 second (frequency in Hz).	1.00 Expert DFNC
Timestamp Latch Source	timestampLatchSource	Specifies the internal event or signal that will latch the timestamp counter into the timestamp buffer.	1.00 Expert DFNC
Frame Start	*FrameStart*	*The timestamp is latched on frame start.*	
Timestamp Reset Cmd	timestampControlReset	Resets the timestamp counter to 0.	1.00 Expert DFNC
Event Selector	EventSelector	Select the Event to enable/disable with the EventNotification feature.	1.00 Expert
Start of Frame	*FrameStart*	*Event sent on control channel on an Active Frame. This occurs with the start of the exposure delay.*	
Start of Exposure	*ExposureStart*	*Event sent on control channel on start of exposure.*	
End of Exposure	*ExposureEnd*	*Event sent on control channel on end of exposure.*	
Acquisition Start Next Valid	*AcquisitionStartNextValid*	*Event sent on control channel when the AcquisitionStart command can be used again.*	
Valid Frame Trigger	*ValidFrameTrigger*	*Event sent on control channel when a valid frame trigger is generated.*	
Invalid Frame Trigger	*InvalidFrameTrigger*	*Event sent on control channel when a frame trigger occurs in an invalid Trigger region. Therefore the trigger is rejected and no frame acquisition occurs.*	
Image Lost	*ImageLost*	*Event sent on control channel when an image is lost due to insufficient memory.*	
Events Overflow	*eventsOverflow*	*Event sent on control channel when all previous active events have been disabled because the camera cannot send them fast enough, generating in internal message overflow. Required events must be re-enabled manually.*	
Event Notification	EventNotification	Enable Events for the event type selected by the EventSelector feature.	1.00 Expert

Off	*Off*	*The selected event is disabled.*	
On	*On*	*The selected event will generate a software event.*	
GigEVisionEvent	*GigEVisionEvent*	*The selected event will generate a software event. This entry is deprecated. Using "On" is recommended.*	
Event Statistic Selector	eventStatisticSelector	Selects which Event statistic to display.	1.00 Expert DFNC
Image Lost	*ImageLost*	*Image is acquired but lost before it's been transferred.*	
Invalid Frame Trigger	*InvalidFrameTrigger*	*Counts the frame trigger occurring in an invalid Trigger region.*	
Packet Resend Count	*PacketResendCount*	*Counts the number of packet resends.*	
Event Statistic Count	eventStatisticCount	Display the count of the selected Event.	1.00 Expert DFNC
Event Statistic Count Reset	eventStatisticCountReset	Reset the count of the selected Event.	1.00 Expert DFNC
Frame Start Data	EventFrameStartData	Data of the frame start event	1.00 Guru
Frame Start Event ID	EventFrameStart	Represents the event ID to identify the EventFrameStart software Event. (RO)	1.00 Guru
Frame Start Event Timestamp	EventFrameStartTimestamp	Timestamp of the EventFrameStart event. (RO)	1.00 Guru
Exposure Start Event ID	EventExposureStart	Represents the event ID to identify the EventExposureStart software Event. (RO)	1.00 Guru
Exposure Start Data	EventExposureStartData	Data of the exposure start event	1.00 Guru
Exposure Start Event Timestamp	EventExposureStartTimestamp	Timestamp of the EventExposureStart event. (RO)	1.00 Guru
Exposure End Event ID	EventExposureEnd	Represents the event ID to identify the EventExposureEnd software Event.	1.00 Guru
Exposure End Data	EventExposureEndData	Data of the exposure end event	1.00 Guru
Exposure End Event Timestamp	EventExposureEndTimestamp	Timestamp of the EventExposureEnd event. (RO)	1.00 Guru
AcquisitionStartNextValid Event ID	EventAcquisitionStartNextValid	Generate an event on acquisition start next valid.	1.00 Guru
Acquisition Start Next Valid End Data	EventAcquisitionStartNextValidData	Data of the acquisition start next valid event.	1.00 Guru
AcquisitionStartNextValid Event Timestamp	EventAcquisitionStartNextValid Timestamp	Timestamp of the acquisition start next valid event. (RO)	1.00 Guru
Valid Frame Trigger Event ID	EventValidFrameTrigger	Generate an event on valid frame trigger.	1.00 Guru
Valid Frame Trigger Data	EventValidFrameTriggerData	Data of the valid frame trigger event.	1.00 Guru
Valid Frame Trigger Event Timestamp	EventValidFrameTrigger Timestamp	Timestamp of the Valid frame trigger event. (RO)	1.00 Guru
InvalidFrameTrigger Event ID	EventInvalidFrameTrigger	Generate an event on invalid frame trigger.	1.00 Guru
Invalid Frame Trigger Data	EventInvalidFrameTriggerData	Data of the invalid frame trigger event.	1.00 Guru
InvalidFrameTrigger Event Timestamp	EventInvalidFrameTrigger Timestamp	Timestamp of the invalid frame trigger event. (RO)	1.00 Guru
ImageLost Event ID	EventImageLost	Generate an event on image lost.	1.00 Guru
Image Lost Data	EventImageLostData	Data of the image lost event	1.00 Guru
ImageLost Event Timestamp	EventImageLostTimestamp	Timestamp of the image lost event. (RO)	1.00 Guru
Events Overflow Event ID	EventeventsOverflow	Represents the event ID to identify the EventeventsOverflow software Event. (RO)	1.00 Guru
Event Overflow Data	EventeventsOverflowData	Data of the event overflow event	1.00 Guru

Events Overflow Event Timestamp	EventeventsOverflowTimestamp	Timestamp of the EventeventsOverflow event.	1.00 Guru
Gev Timestamp Latch	GevtimestampControlLatch	Latch the current timestamp internal counter value in the timestampValue feature.	1.00 Invisible
Gev Timestamp Value	GevtimestampValue	Returns the 64-bit value of the timestamp counter.	1.00 Invisible
Gev Timestamp Tick Frequency	GevtimestampTickFrequency	Indicates the number of timestamp ticks (or increments) during 1 second (frequency in Hz).	1.00 Invisible
Gev Timestamp Reset	GevtimestampControlReset	Resets the timestamp counter to 0.	1.00 Invisible

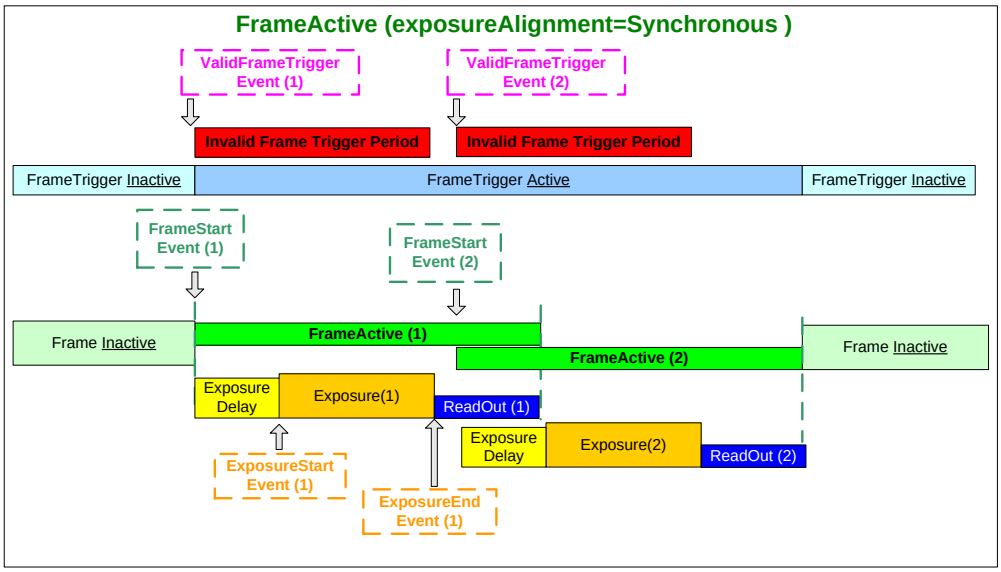
Basic Exposure Events Overview

The following timing graphic shows the primary events related to a simple acquisition.



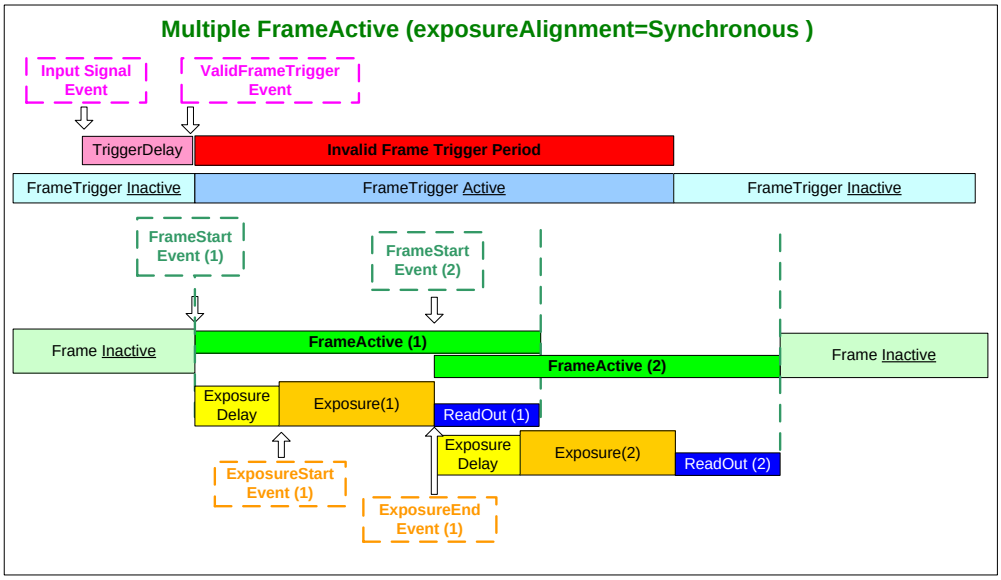
Events Associated with Triggered Synchronous Exposures

The following timing graphic shows the primary events and acquisition timing associated with a synchronous exposure of two individually triggered frames.



Events Associated with Triggered Multiple Frame Synchronous Exposures

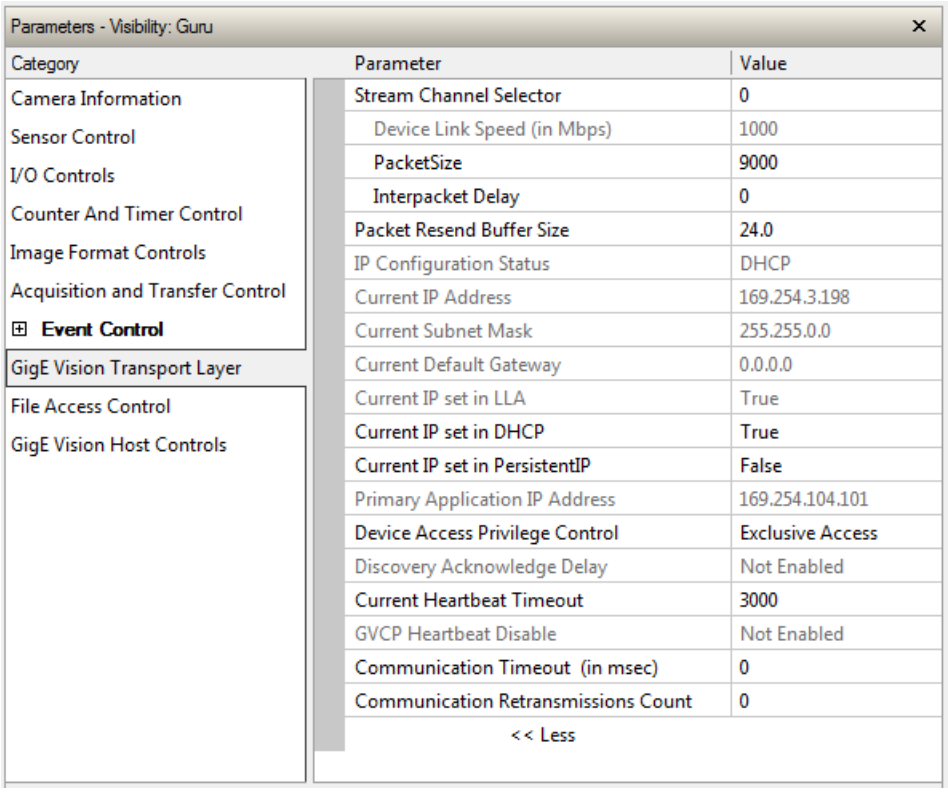
The following timing graphic shows the primary events and acquisition timing associated with a synchronous exposure of two frames from a single trigger event.



GigE Vision Transport Layer Control Category

The Genie Nano GigE Vision Transport Layer control, as shown by CamExpert, groups parameters used to configure features related to GigE Vision specification and the Ethernet Connection. Parameters in gray are read only, either always or due to another parameter being disabled. Parameters in black are user set in CamExpert or programmable via an imaging application.

Features listed in the description table but tagged as *Invisible* are usually for Teledyne DALSA or third party software usage—not typically needed by end user applications. Also important, Genie Nano cameras are available in a number of models implementing different sensors and image resolutions which may not support the full feature set defined in this category.



GigE Vision Transport Layer Feature Descriptions

The following table describes these parameters along with their view attribute and minimum camera firmware version required. Additionally the Device Version column will indicate which parameter is a member of the DALSA Features Naming Convention (denoted by DFNC), versus the GenICam Standard Features Naming Convention (SFNC tag is not shown).

The Device Version number represents the camera software functional group, not a firmware revision number. As Genie Nano capabilities evolve the device version tag will increase, therefore identifying the supported function package. New features for a major device version release will be indicated by green text for easy identification.

Display Name	Feature & Values	Description	Device Version & View
Stream Channel Selector	GevStreamChannelSelector	Selects the stream channel to control.	1.00 Expert
Device Link Speed	GevLinkSpeed	Indicates the transmission speed negotiated by the given network interface.	1.00 Expert
PacketSize	GevSCPSPacketSize	Specifies the stream packet size in bytes to send on this channel.	1.00 Expert
Interpacket Delay	GevSCPD	Indicates the delay (in µs) to insert between each packet for this stream channel.	1.00 Expert
Packet Resend Buffer Size	devicePacketResendBufferSize	Indicates the amount of memory to reserve in MBytes for the packet resend buffer	1.00 DFNC Guru
IP Configuration Status	GevIPConfigurationStatus	Reports the current IP configuration status. (RO)	1.00 Guru
None	*None*	*Device IP Configuration is not defined.*	
PersistentIP	*PersistentIP*	*Device IP Address Configuration is set to Persistent IP (static).*	
DHCP	*DHCP*	*Device IP Address Configuration is set to DHCP (Dynamic Host Configuration Protocol). Network requires a DHCP server.*	
LLA	*LLA*	*Device IP Address Configuration is set to LLA (Link-Local Address). Also known as Auto-IP. Used for unmanaged networks including direct connections from a device to a dedicated NIC.*	
ForceIP	*ForceIP*	*Device IP Address Configuration is set to ForceIP. Used to force an IP address change.*	
Current IP Address	GevCurrentIPAddress	Reports the IP address for the given network interface.	1.00 Beginner
Current Subnet Mask	GevCurrentSubnetMask	Reports the subnet mask of the given interface.	1.00 Beginner
Current Default Gateway	GevCurrentDefaultGateway	Reports the default gateway IP address to be used on the given network interface.	1.00 Beginner
Current IP set in LLA	GevCurrentIPConfigurationLLA	Controls whether the LLA (Link Local Address) IP configuration scheme is activated on the given network interface.	1.00 Guru
Current IP set in DHCP	GevCurrentIPConfigurationDHCP	Controls whether the DHCP IP configuration scheme (Dynamic Host Configuration Protocol) is activated on the given network interface.	1.00 Guru
Current IP set in PersistentIP	GevCurrentIPConfigurationPersistentIP	Controls whether the PersistentIP configuration scheme is activated on the given network interface.	1.00 Guru
Primary Application IP Address	GevPrimaryApplicationIPAddress	Returns the IP address of the device hosting the primary application. (RO)	1.00 Guru
Device Access Privilege Control	deviceCCP	Controls the device access privilege of an application.	1.00 Guru DFNC
Exclusive Access	*ExclusiveAccess*	*Grants exclusive access to the device to an application. No other application can control or monitor the device.*	
Control Access	*ControlAccess*	*Grants control access to the device to an application. No other application can control the device.*	
Control Access Switchover Active	*ControlAccessSwitchoverActive*	*Enables another application to request control access to the device.*	
Discovery Acknowledge Delay	GevDiscoveryAckDelay	Indicates the maximum randomized delay the device will wait to acknowledge a discovery command. (RO)	1.00 Guru

Current Heartbeat Timeout	GevHeartbeatTimeout	Indicates the current heartbeat timeout in milliseconds.	1.00 Guru
GVCP Heartbeat Disable	GevGVCPHeartbeatDisable	Disables the GVCP (GigE Vision Control Protocol) heartbeat monitor. This allows control switchover to an application on another device.	1.00 Expert
Communication Timeout	GevMCTT	Provides the transmission timeout value in milliseconds.	1.00 Guru
Communication Retransmissions Count	GevMCRC	Indicates the number of retransmissions allowed when a message channel message times out.	1.00 Guru
Gev GVSP Extended ID Mode	GevGVSPExtendedIDMode	Enables the extended ID mode.	1.00 Expert
Fire Test Packet	GevSCPSFireTestPacket	When this feature is set to True, the device will fire one test packet.	1.00 Invisible
Payload Size	PayloadSize	Provides the number of bytes transferred for each image or chunk on the stream channel.	1.00 Invisible
MAC Address	GevMACAddress	MAC address of the network interface.	1.00 Invisible
Current Camera IP Configuration	GevCurrentIPConfiguration	Current camera IP configuration of the selected interface.	1.00 Invisible
LLA	*LLA*	*Link-Local Address Mode*	
DHCP	*DHCP*	*Dynamic Host Configuration Protocol Mode. Network requires a DHCP server.*	
PersistentIP	*PersistentIP*	*Persistent IP Mode (static)*	
Persistent IP Address	GevPersistentIPAddress	Persistent IP address for the selected interface. This is the IP address the camera uses when booting in Persistent IP mode.	1.00 Invisible
Persistent Subnet Mask	GevPersistentSubnetMask	Persistent subnet mask for the selected interface.	1.00 Invisible
Persistent Default Gateway	GevPersistentDefaultGateway	Persistent default gateway for the selected interface.	1.00 Invisible
Primary Application Socket	GevPrimaryApplicationSocket	Returns the UDP (User Datagram Protocol) source port of the primary application.	1.00 Invisible
Device Access Privilege Control	GevCCP	Controls the device access privilege of an application.	1.00 Invisible
Open Access	*OpenAccess*	*OpenAccess*	
Exclusive Access	*ExclusiveAccess*	*Grants exclusive access to the device to an application. No other application can control or monitor the device.*	
Control Access	*ControlAccess*	*Grants control access to the device to an application. No other application can control the device.*	
Control Access Switchover Active	*ControlAccessSwitchoverActive*	*Enables another application to request control access to the device.*	
Interface Selector	GevInterfaceSelector	Selects which physical network interface to control.	1.00 Invisible
Number Of Interfaces	GevNumberOfInterfaces	Indicates the number of physical network interfaces supported by this device. (RO)	1.00 Invisible
Message Channel Count	GevMessageChannelCount	Indicates the number of message channels supported by this device. (RO)	1.00 Invisible
Stream Channel Count	GevStreamChannelCount	Indicates the number of stream channels supported by this device (0 to 512). (RO)	1.00 Invisible
Gev Supported Option Selector	GevSupportedOptionSelector	Selects the GEV option to interrogate for existing support. (RO)	1.00 Invisible

	IPConfigurationLLA *IPConfigurationDHCP* *IPConfigurationPersistentIP* *StreamChannelSourceSocket* *MessageChannelSourceSocket* *CommandsConcatenation* *WriteMem* *PacketResend* *Event* *EventData* *PendingAck* *Action* *PrimaryApplicationSwitchover* *ExtendedStatusCodes* *DiscoveryAckDelay* *DiscoveryAckDelayWritable* *TestData* *ManifestTable* *CCPApplicationSocket* *LinkSpeed* *HeartbeatDisable* *SerialNumber* *UserDefinedName* *StreamChannel0BigAndLittleEndian* *StreamChannel0IPReassembly* *StreamChannel0UnconditionalStreaming* *StreamChannel0ExtendedChunkData*		
Gev Supported Option	GevSupportedOption	Returns TRUE if the selected GEV option is supported. (RO)	1.00 Invisible
LLA Supported	GevSupportedIPConfigurationLLA	Indicates if LLA (Auto-IP) is supported by the selected interface. The LLA method automatically assigns the Nano with a randomly chosen address on the 169.254.xxx.xxx subnet. After an address is chosen, the link-local process sends an ARP query with that IP onto the network to see if it is already in use. If there is no response, the IP is assigned to the device, otherwise another IP is selected, and the ARP is repeated. Note that LLA is unable to forward packets across routers. LLA is the recommended scheme when only one NIC is connected to GigE cameras; ensure only one NIC is using LLA on your PC, otherwise IP conflicts will result. (RO)	1.00 Invisible
DHCP Supported	GevSupportedIPConfigurationDHCP	Indicates if DHCP is supported by the selected interface. This IP configuration mode requires a DHCP server to allocate an IP address dynamically over the range of some defined subnet. The Nano must be configured to have DHCP enabled. This is the factory default settings. The DHCP server is part of a managed network. Windows itself does not provide a DHCP server function therefore a dedicated DHCP server is required. The DALSA Network Configuration Tool can be configured as a DHCP server on the NIC used for the GigE Vision network. (RO)	1.00 Invisible
Persistent IP Supported	GevSupportedIPConfigurationPersistentIP	Indicates if Persistent IP is supported by the selected interface. This protocol is only suggested if the user fully controls the assignment of IP addresses on the network and a GigE Vision camera is connected beyond routers. The GigE Vision camera is forced a static IP address. The NIC IP address must use the same subnet otherwise the camera is not accessible. If the Nano camera is connected to a network with a different subnet, it cannot be accessed. (RO)	1.00 Invisible
GVCP Extended Status Codes	GevGVCPExtendedStatusCodes	Enables generation of extended status codes. (RO)	1.00 Invisible

GVCP Pending Timeout	GevGVCPPendingTimeout	Indicates the longest GVCP command execution time before a device returns a PENDING_ACK.	1.00 Invisible
Gev MCP HostPort	GevMCPHostPort	Indicates the port to which the device must send messages. (RO)	1.00 Invisible
Gev MCDA	GevMCDA	Indicates the destination IP address for the message channel. (RO)	1.00 Invisible
Gev MCSP	GevMCSP	This feature indicates the source port for the message channel. (RO)	1.00 Invisible
Stream Channel Interface Index	GevSCPInterfaceIndex	Index of network interface. (RO)	1.00 Invisible
Gev SCP HostPort	GevSCPHostPort	Indicates the port to which the device must send the data stream. (RO)	1.00 Invisible
Gev SCDA	GevSCDA	Indicates the destination IP address for this stream channel. (RO)	1.00 Invisible
Gev SCSP	GevSCSP	Indicates the source port of the stream channel. (RO)	1.00 Invisible
Gev First URL	GevFirstURL	Indicates the first URL to the XML device description file.	1.00 Invisible
Gev Second URL	GevSecondURL	Indicates the second URL to the XML device description file.	1.00 Invisible
Gev Major Version	GevVersionMajor	Major version of the specification.	1.00 Invisible
Gev Minor Version	GevVersionMinor	Minor version of the specification.	1.00 Invisible
Manifest Entry Selector	DeviceManifestEntrySelector	Selects the manifest entry to reference.	1.00 Invisible
XML Major Version	DeviceManifestXMLMajorVersion	Indicates the major version number of the XML file of the selected manifest entry.	1.00 Invisible
XML Minor Version	DeviceManifestXMLMinorVersion	Indicates the Minor version number of the XML file of the selected manifest entry.	1.00 Invisible
XML SubMinor Version	DeviceManifestXMLSubMinorVersion	Indicates the SubMinor version number of the XML file of the selected manifest entry.	1.00 Invisible
Schema Major Version	DeviceManifestSchemaMajorVersion	Indicates the major version number of the Schema file of the selected manifest entry.	1.00 Invisible
Schema Minor Version	DeviceManifestSchemaMinorVersion	Indicates the minor version number of the Schema file of the selected manifest entry.	1.00 Invisible
Manifest Primary URL	DeviceManifestPrimaryURL	Indicates the first URL to the XML device description file of the selected manifest entry.	1.00 Invisible
Manifest Secondary URL	DeviceManifestSecondaryURL	Indicates the second URL to the XML device description file of the selected manifest entry.	1.00 Invisible
Device Mode Is Big Endian	GevDeviceModeIsBigEndian	Endianess of the device registers.	1.00 Invisible
Device Mode CharacterSet	GevDeviceModeCharacterSet	Character set used by all the strings of the bootstrap registers.	1.00 Invisible
	reserved1 *UTF8* *reserved2*		
GevSCPSDoNotFragment	GevSCPSDoNotFragment	This feature state is copied into the "do not fragment" bit of IP header of each stream packet. (RO)	1.00 Invisible
Gev SCPS BigEndian	GevSCPSBigEndian	Endianess of multi-byte pixel data for this stream. (RO)	1.00 Invisible

Defaults for devicePacketResendBufferSize

The default minimum for devicePacketResendBufferSize allows at least two maximum sized buffer. Resend buffers hold the last images that have been transferred to host. More buffers allow more possible resend packets.

But it is important to remember that increasing the packet resend buffer value consumes internal memory used for image buffers waiting to transfer. This will reduce the number of frames acquired at frame rates exceeding the transfer rates possible to the host computer. Memory size is monitored with the feature "transferQueueMemorySize".

GigE Vision Host Control Category

The GigE Vision Host controls, as shown by CamExpert, groups parameters used to configure the host computer system GigE Vision features used for Genie Nano networking management. None of these parameters are stored in any Genie Nano camera.

These features allow optimizing the network configuration for maximum Nano bandwidth. Settings for these parameters are highly dependent on the number of cameras connected to a NIC, the data rate of each camera and the trigger modes used.

Information on these features is found in the Teledyne DALSA Network Imaging Module User manual.

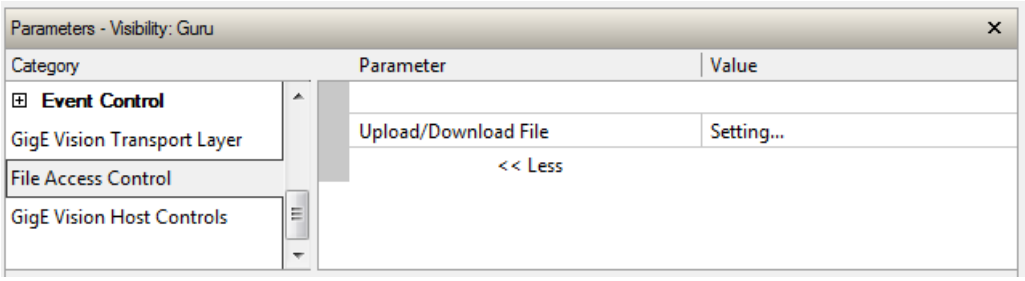
Teledyne DALSA TurboDrive

For Genie Nano cameras supporting TurboDrive, ensure to set the feature "***Turbo Transfer Mode***" to ***True***.

File Access Control Category

The File Access control in CamExpert allows the user to quickly upload various data files to the connected Genie Nano. The supported data files are for firmware updates, etc.

Features listed in the description table but tagged as *Invisible* are usually for Teledyne DALSA or third party software usage—not typically needed by end user applications. Also important, Genie Nano cameras are available in a number of models implementing different sensors and image resolutions which may not support the full feature set defined in this category.



File Access Control Feature Descriptions

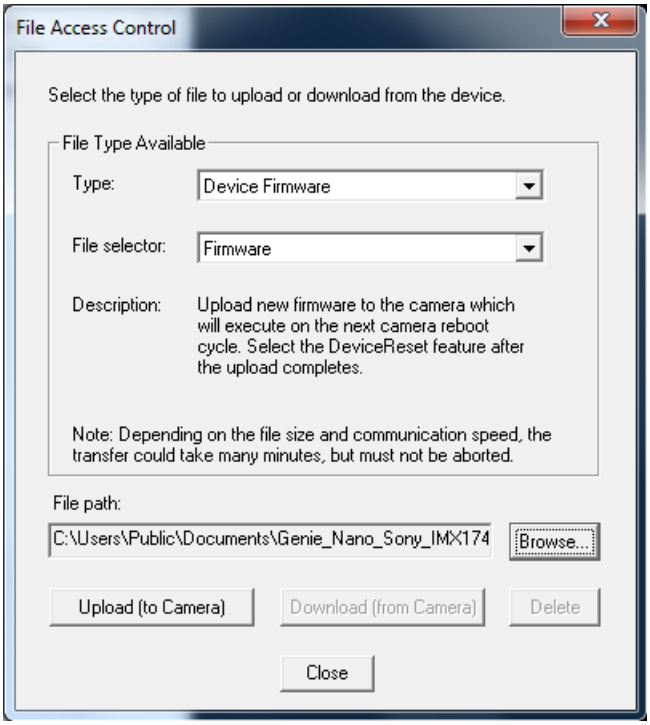
The Device Version number represents the camera software functional group, not a firmware revision number. As Genie Nano capabilities evolve the device version tag will increase, therefore identifying the supported function package. New features for a major device version release will be indicated by green text for easy identification.

Display Name	Feature & Values	Description	Device Version & View
File Selector	FileSelector	Selects the file to access. The file types which are accessible are device-dependent.	1.00 Guru
Firmware	*Firmware1*	*Upload new firmware to the camera which will execute on the next camera reboot cycle. Select the DeviceReset feature after the upload completes.*	
File Operation Selector	FileOperationSelector	Selects the target operation for the selected file in the device. This operation is executed when the File Operation Execute feature is called.	1.00 Guru
Open	*Open*	*Select the Open operation - executed by FileOperationExecute.*	
Close	*Close*	*Select the Close operation - executed by FileOperationExecute*	
Read	*Read*	*Select the Read operation - executed by FileOperationExecute.*	
Write	*Write*	*Select the Write operation - executed by FileOperationExecute.*	
Delete	*Delete*	*Select the Delete operation - executed by FileOperationExecute.*	
File Operation Execute	FileOperationExecute	Executes the operation selected by File Operation Selector on the selected file.	1.00 Guru
User Defined Saved Image	userDefinedSavedImage	Upload or download an image in the camera.	1.00 DFNC Guru
File Open Mode	FileOpenMode	Selects the access mode used to open a file on the device.	1.00

Read	*Read*	*Select READ only open mode*	Guru
Write	*Write*	*Select WRITE only open mode*	
File Access Buffer	FileAccessBuffer	Defines the intermediate access buffer that allows the exchange of data between the device file storage and the application.	1.00 Guru
File Access Offset	FileAccessOffset	Controls the mapping offset between the device file storage and the file access buffer.	1.00 Guru
File Access Length	FileAccessLength	Controls the mapping length between the device file storage and the file access buffer.	1.00 Guru
File Operation Status	FileOperationStatus	Displays the file operation execution status. (RO)	1.00 Guru
Success	*Success*	*The last file operation has completed successfully.*	
Failure	*Failure*	*The last file operation has completed unsuccessfully for an unknown reason.*	
File Unavailable	*FileUnavailable*	*The last file operation has completed unsuccessfully because the file is currently unavailable.*	
File Invalid	*FileInvalid*	*The last file operation has completed unsuccessfully because the selected file in not present in this camera model.*	
File Operation Result	FileOperationResult	Displays the file operation result. For Read or Write operations, the number of successfully read/written bytes is returned. (RO)	1.00 Guru
File Size	FileSize	Represents the size of the selected file in bytes.	1.00 Guru
Device User Buffer	deviceUserBuffer	Unallocated memory available to the user for data storage.	1.00 DFNC Invisible
User Defined Saved Image Max Size	userDefinedSavedImageMax Size	Maximum size of the user Defined Saved Image.	1.00 DFNC Invisible

Updating Firmware via File Access in CamExpert

- Click on the “Setting…” button to show the file selection menu.



- From the **File Type** drop menu, select the file **Type** that will be uploaded to the Genie Nano. This CamExpert tool allows quick firmware changes or updates, when available for your Genie Nano model.
- From the **File Selector** drop menu, select the Genie Nano memory location for the uploaded data. This menu presents only the applicable data locations for the selected file type.
- Click the Browse button to open a typical Windows Explorer window.
- Select the specific file from the system drive or from a network location.
- Click the Upload button to execute the file transfer to the Genie Nano.
- Reset the Nano when prompted.

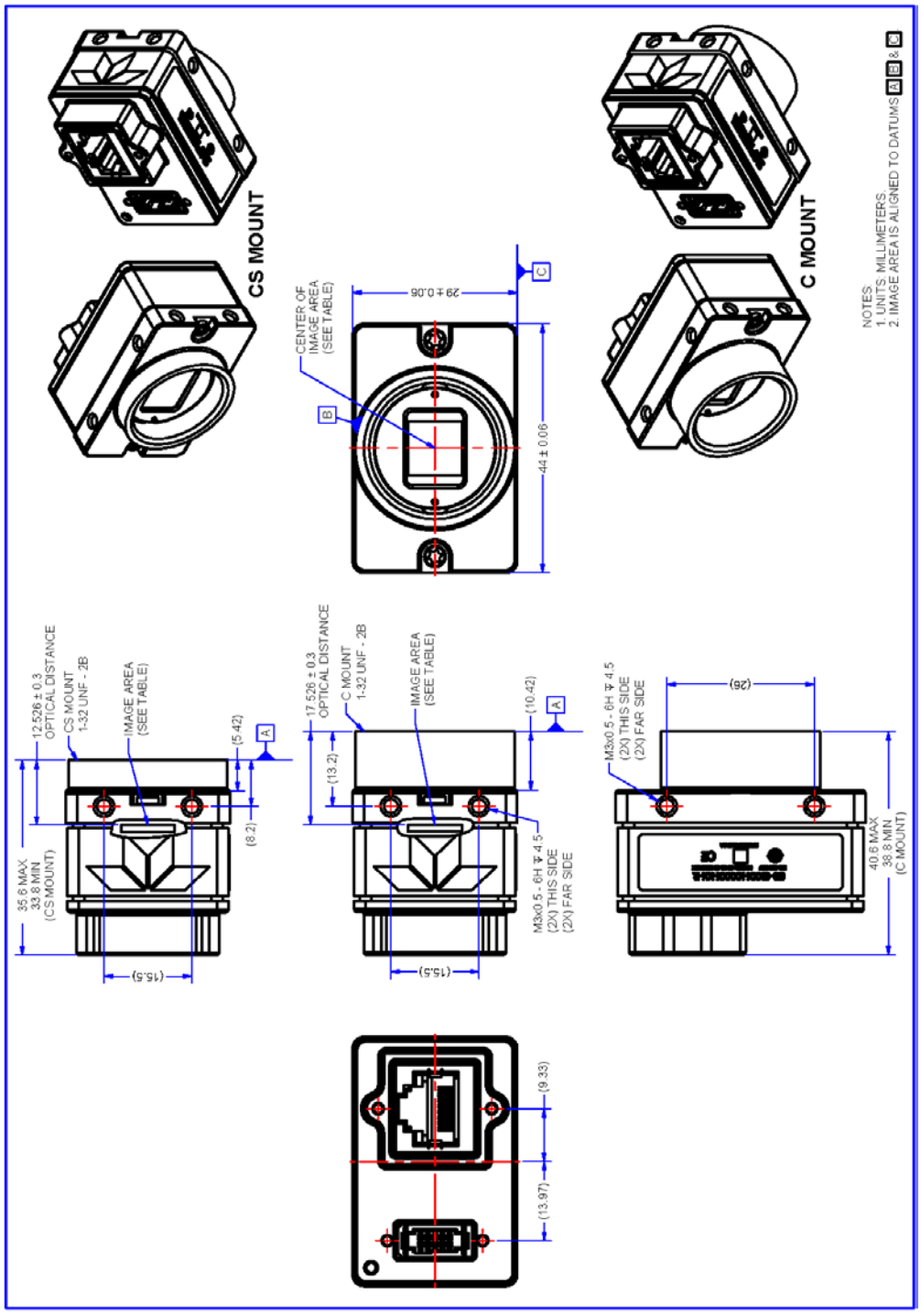
Sapera Tools for Networking

Nano IP Configuration Mode Details

In general automatic IP configuration assignment (LLA/DHCP) is sufficient for most Nano installations. Please refer to the **Teledyne DALSA Network Imaging Package manual** for information on the Teledyne DALSA Network Configuration tool and network optimization for GigE Vision cameras and devices.

Technical Specifications

Mechanical Specifications:



Note: Genie Nano with C or CS Mount

Additional Notes on Genie Nano Identification and Mechanical

Identification Label

Genie Nano cameras have an identification label applied to the bottom side, with the following information:

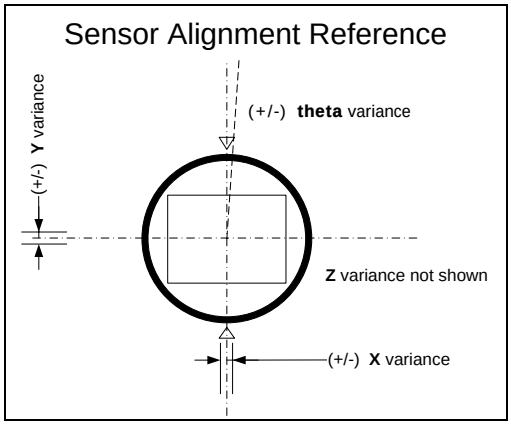
- Model Part Number
- Serial number
- MAC ID
- 2D Barcode
- CE and FCC logo

Additional Mechanical Notes

Nano supports a screw lock Ethernet cable as described in Ruggedized RJ45 Ethernet Cables.
For information on Nano lens requirements see Optical Considerations.
Each camera side has two mounting holes in identical locations, which provide good grounding capabilities.
Overall height or width tolerance is ± 0.05mm.

Sensor Alignment Specification

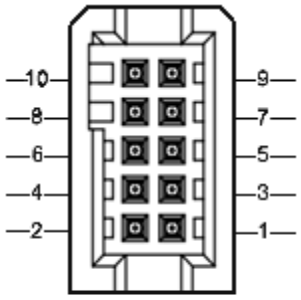
The following figure specifies sensor alignment for Genie Nano where all specifications define the absolute maximum tolerance allowed for production cameras. Dimensions "x, y, z", are in microns and referenced to the Genie Nano mechanical body or the optical focal plane (for the z-axis dimension). Theta specifies the sensor rotation relative to the sensor's center and Nano mechanical.



	Camera Models M/C1940 & M/C1920
X variance	+/- 250 microns
Y variance	+/- 250 microns
Z variance	+/- 300 microns
Theta variance	+/- 1 degree

Connectors

- A single **RJ45 Ethernet** connector for control and video data to the host Gigabit NIC. Additionally for PoE, the Genie Nano requires an appropriate PoE Class 0 or Class 3 (or greater) power source device (such as a powered computer NIC, or a powered Ethernet switch, or an Ethernet power injector). For industrial environments, Nano supports the use of screw lock Ethernet cables (see "Ruggedized RJ45 Ethernet Cables" on page 102). Note that for PoE installations, a shielded Ethernet cable is required to provide a camera ground connection to the controlling computer.
- A single 10-pin connector (SAMTEC TFM-105-02-L-D-WT) for all Genie Nano I/O and an auxiliary DC power source. Nano supports connecting cables with retention latches or screw locks. The following figure shows pin number assignment.



SAMTEC
TFM-105-02-L-D-WT

10-pin I/O Connector Details

Teledyne DALSA makes available optional I/O cables as described in Accessories. Contact Sales for availability and pricing.

Pin Number	Genie Nano	Direction	Definition
1	PWR-GND	-	Camera Power - Ground
2	PWR-VCC	-	Camera Power – DC +10 to +36 Volts
3	GPI-Common	-	General Input Common Ground
4	GPO-Power	-	General Output Common Power
5	GPI 1	In	General External Input 1
6	GPO 1	Out	General External Output 1
7	GPI 2	In	General External Input 2
8	GPO 2	Out	General External Output 2
9	Reserved		
10	Chassis		Camera Chassis

I/O Mating Connector Sources

For users wishing to build their own custom I/O cabling, the following product information is provided to expedite your cable solutions.

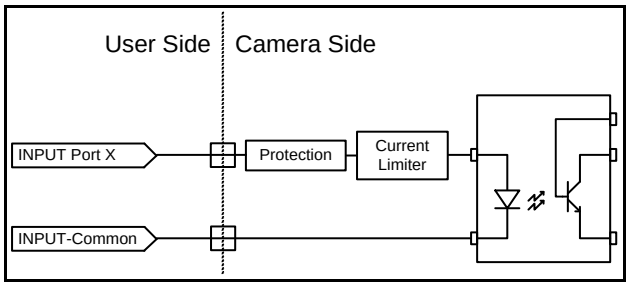
MFG	Part #	Description	Data Sheet
Samtec	SFSD-05-[WG]-G-[AL]-DR-[E2O] *WG : Wire Gauge* *AL : Assembled Length* *E2O : End 2 Option*	Discrete Cable Assembly	www.samtec.com/technical-specifications/Default.aspx?SeriesMaster=SFSD
Samtec	ISDF-05-D-M	Discrete Connector	www.samtec.com/technical-specifications/Default.aspx?SeriesMaster=ISDF
ISDF-05-D-M Connector Availability On-Line			
North-America (specific country can be selected)		http://www.newark.com/samtec/isd2-05-d-m/connector-housing-10pos-2mm/dp/84T0350	
Europe (specific country can be selected)		http://uk.farnell.com/samtec/isdf-05-d-m/receptacle-1-27mm-crimp-10way/dp/2308547?ost=ISDF-05-D-M	
Asia-Pacific (specific country can be selected)		http://sg.element14.com/samtec/isdf-05-d-m/receptacle-1-27mm-crimp-10way/dp/2308547?ost=ISDF-05-D-M	

Power over Ethernet (PoE) Support

- The Genie Nano requires a PoE Class 0 or Class 3 (or greater) power source when not using a separate external power source connected to pins 1 & 2 of the Connector.
- To use PoE, the camera setup requires a powered computer NIC, or a powered Ethernet switch, or an Ethernet power injector.
- The Genie Nano is protected and will not fail in the case of have both an external supply and PoE connected at the same time.
- If both supplies are connected and active, the Nano will use the power supply I/O connector.

Input Signals Electrical Specifications

External Inputs Block Diagram



External Input Details

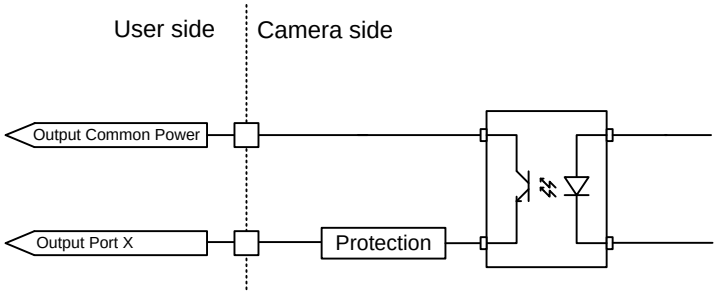
- Opto-coupled (2.4V to 24V) with internal current limit.
- Selectable input trigger threshold levels for TTL, 12V, and 24V signal inputs (see *lineDetectionLevel* feature).
- Used as trigger acquisition event, counter or timestamp event, or integration control.
- User programmable debounce time from 0 to 255µs in 1µs steps.
- Source signal requirements:
  - Single-ended driver meeting TTL, 12V, or 24V standards
  - Differential signal drivers cannot be used due to the shared input common

External Input AC Timing Characteristics

Conditions	Description	Min	Unit
Input Pulse 0V - 3V	Input Pulse width High	1.3	µs
	Input Pulse width Low	1.7	µs
	Max Frequency	315	KHz
Input Pulse 0V - 5V	Input Pulse width High	0.6	µs
	Input Pulse width Low	2	µs
	Max Frequency	247	KHz
Input Pulse 0V -12V	Input Pulse width High	0.39	µs
	Input Pulse width Low	3	µs
	Max Frequency	160	KHz
Input Pulse 0V - 24V	Input Pulse width High	0.39	µs
	Input Pulse width Low	4.9	µs
	Max Frequency	103	KHz

Output Signals Electrical Specifications

External Outputs Block Diagram



External Output Details

- Programmable output mode such as strobe, event notification, etc (see *outputLineSource* feature)
- Outputs are open on power-up with the default factory settings
- A software reset will not reset the outputs to the open state if the outputs are closed
- A user setup configured to load on boot will not reset the outputs to the open state if the outputs are closed
- No output signal glitch on power-up or polarity reversal
- Maximum Common Power Voltage: 30Vdc
- Maximum Output Current: 36mA

Computer Requirements for Nano Cameras

The following information is a guide to computer and networking equipment required to support the Nano camera at maximum performance. The Nano camera series complies with the current IPv4 Internet Protocol, therefore current Gigabit Ethernet (GigE) equipment should provide trouble free performance.

Host PC System

- Operating System: Windows 7, 8.0, 8.1 (either 32-bit or 64-bit for all) are supported.
- Operating System: Linux (scheduled support - TBD)

Network Adapters

- GigE network adapter (either add on card or on motherboard). The Intel PRO/1000 MT adapter is an example of a high performance NIC. Typically a system will need an Ethernet GigE adapter to supplement the single NIC on the motherboard.
- PCI Express adapters will outperform PCI adapters.
- Network adapters that support Jumbo Frames will outperform adapters with fixed packet size frames.
- 10/100 Ethernet is not supported.

Laptop Information

- Older laptop computers with built in GigE network adapters may still not be able to stream full frame rates from Nano. Thorough testing is required with any laptop computer to determine the maximum frame rate possible (refer to the Teledyne DALSA Network Imaging Package user's manual).

Ethernet Switch Requirements

When there is more than one device on the same network or a camera-to-PC separation greater than 100 meters, an Ethernet switch is required. Since the Genie Nano GigE camera complies with the Internet Protocol, it should work with all standard Ethernet switches. However, switches offer a range of functions and performance grades, so care must be taken to choose the right switch for a particular application.

IEEE 802.3x Pause Frame Flow Control

Ethernet Switches supporting Full-duplex IEEE 802.3x Pause Frame Flow Control must be used in situations where multiple cameras may be triggered simultaneously. In such a case the NIC maximum bandwidth would be exceeded if there was no mechanism to temporarily hold back data from cameras. Nano cameras support the IEEE 802.3x pause frame flow control protocol automatically so that images from many cameras can be transmitted through the switch to the NIC efficiently, without data loss. As a working example, one such switch tested at Teledyne DALSA is the NETGEAR GS716T.

	**Important**: The maximum frame rate possible from a large number of Nano cameras which are simultaneously triggered will depend on the Nano model, frame size, and network details. Additionally using Pause Frame may change the Jumbo Frame value which maximizes data throughput. Each imaging system should be tested for data rate limits.

Ethernet to Fiber-Optic Interface Requirements

In cases of camera-to-PC separations of more than 100 meters but an Ethernet switch is not desired, a fiber-optic media converter can be used. The FlexPoint GX from Omnitron Systems (www.omnitron-systems.com) converts GigE to fiber transmission and vice versa. It supports multimode (MM) fiber over distances of up to 220 m (720 ft.) and single-mode (SM) fiber up to 65 km (40 mi.) with SC, MT-RJ, or LC connector types.

Important: The inclusion in this manual of GigE to fiber-optic converters does not guarantee they will meet specific application requirements or performance. The user must evaluate any supplemental Ethernet equipment.

EC & FCC Declarations of Conformity

Pending

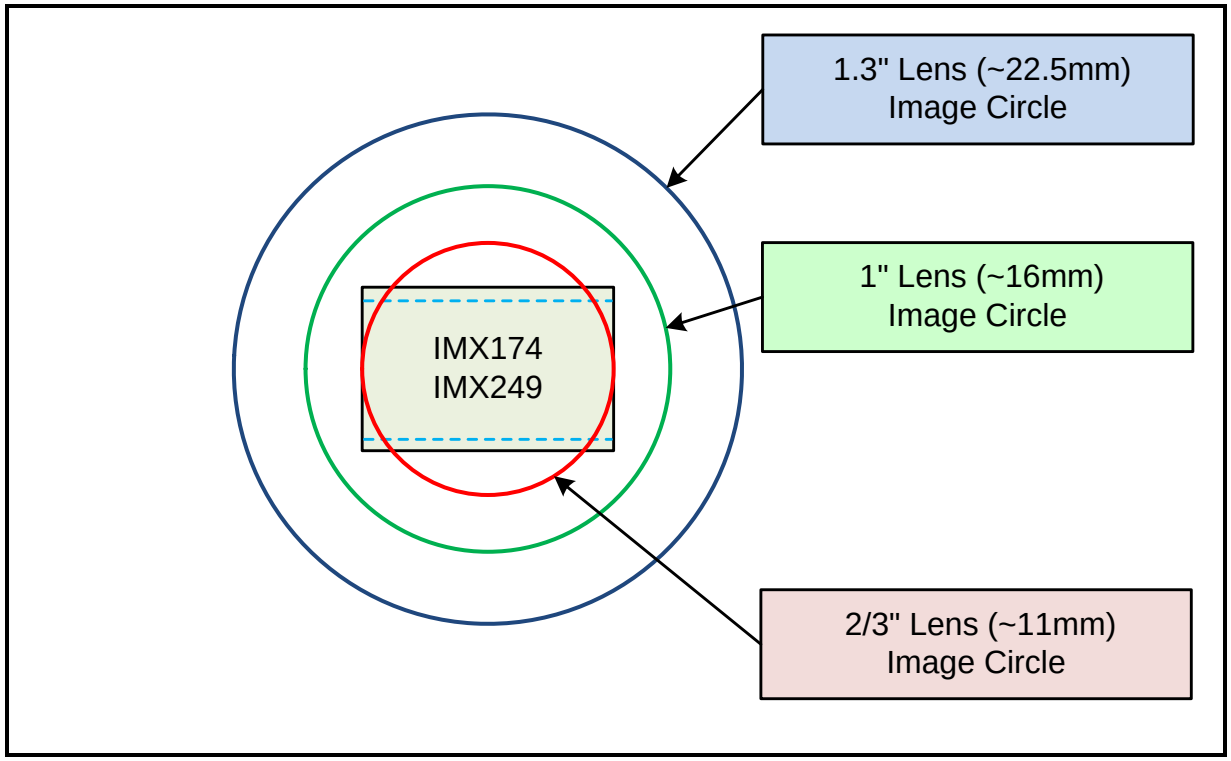
Additional Reference Information

Lens Selection Overview

This section provides a general overview to selecting a lens for the various models of Genie Nano. Brief information on other lens parameters to consider follows those sections.

Lens Options for Models 'M/C194x' & 'M/C192x'

- The following figure shows the lens image circles relative to Genie Nano models using the Sony IMX174 and IMX249 sensors respectively.
- A typical 1" lens will fully illuminate these sensors while the use of a 2/3" lens will have some corner vignetting.
- Note the "horizontal **blue** dashed lines" defining the HD video format. These indicate setting the Image Format controls to Height=1080 with a Vertical Offset=60.



Additional Lens Parameters (application specific)

There are other lens parameters that are chosen to meet the needs of the vision application. These parameters are independent of the Nano model (assuming that the Lens Mount and Lens Sensor Size parameters are correct, as previously covered in this section). A vision system integrator or lens specialist should be consulted when choosing lenses since there is a trade-off between the best lenses and cost. An abridged list of lens parameters follows – all of which need to be matched to the application.

- **Focal Length**: Defines the focus point of light from infinity. This parameter is related to the Nano mount (C or CS mount). See Genie Nano Common Specifications — Back Focal Distance.
- **Field of View**: A lens is designed to image objects at some limited distance range, at some positive or negative magnification. This defines the field of view.
- **F-Number (aperture)**: The lens aperture defines the amount of light that can pass. Lenses may have fixed or variable apertures. Additionally the lens aperture affects Depth of Field which defines the distance range which is in focus when the lens is focus at some specific distance.
- **Image Resolution and Distortion**: A general definition of image quality. A lens with poor resolution seems to never be in focus when used to image fine details.
- **Aberrations (defect, chromatic, spherical)**: Aberrations are specific types of lens faults affecting resolution and distortion. Lens surface defects or glass faults distort all light or specific colors. Aberrations are typically more visible when imaging fine details.
- **Spatial Distortions**: Describes non-linear lens distortions across the field of view. Such distortion limits the accuracy of measurements made with that lens.

Optical Considerations

This section provides an overview to illumination, light sources, filters, lens modeling, and lens magnification. Each of these components contribute to the successful design of an imaging solution.

Illumination

The amount and wavelengths of light required to capture useful images depend on the particular application. Factors include the nature, speed, and spectral characteristics of objects being imaged, exposure times, light source characteristics, environmental and acquisition system specifics, and more. The Teledyne DALSA Web site, http://mv.dalsa.com/, provides an introduction to this potentially complicated issue. Click on Knowledge Center and then select Application Notes and Technology Primers. Review the sections of interest.

It is often more important to consider exposure than illumination. The total amount of energy (which is related to the total number of photons reaching the sensor) is more important than the rate at which it arrives. For example, 5μJ/cm^2 can be achieved by exposing 5mW/cm^2 for 1ms just the same as exposing an intensity of 5W/cm^2 for 1μs.

Light Sources

Keep these guidelines in mind when selecting and setting up light source:

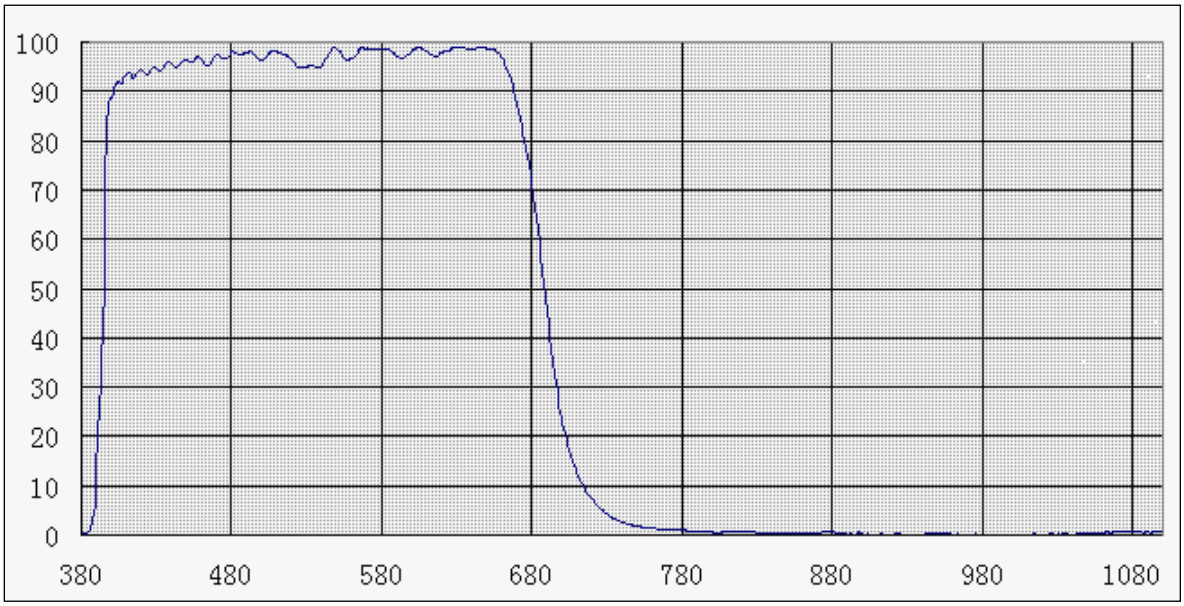
- LED light sources are relatively inexpensive, provide a uniform field, and longer life span compared to other light sources. However, they also require a camera with excellent sensitivity.
- Halogen light sources generally provide very little blue relative to infrared light (IR).
- Fiber-optic light distribution systems generally transmit very little blue relative to IR.
- Some light sources age such that over their life span they produce less light. This aging may not be uniform—a light source may produce progressively less light in some areas of the spectrum but not others.

IR Cut-off Filters

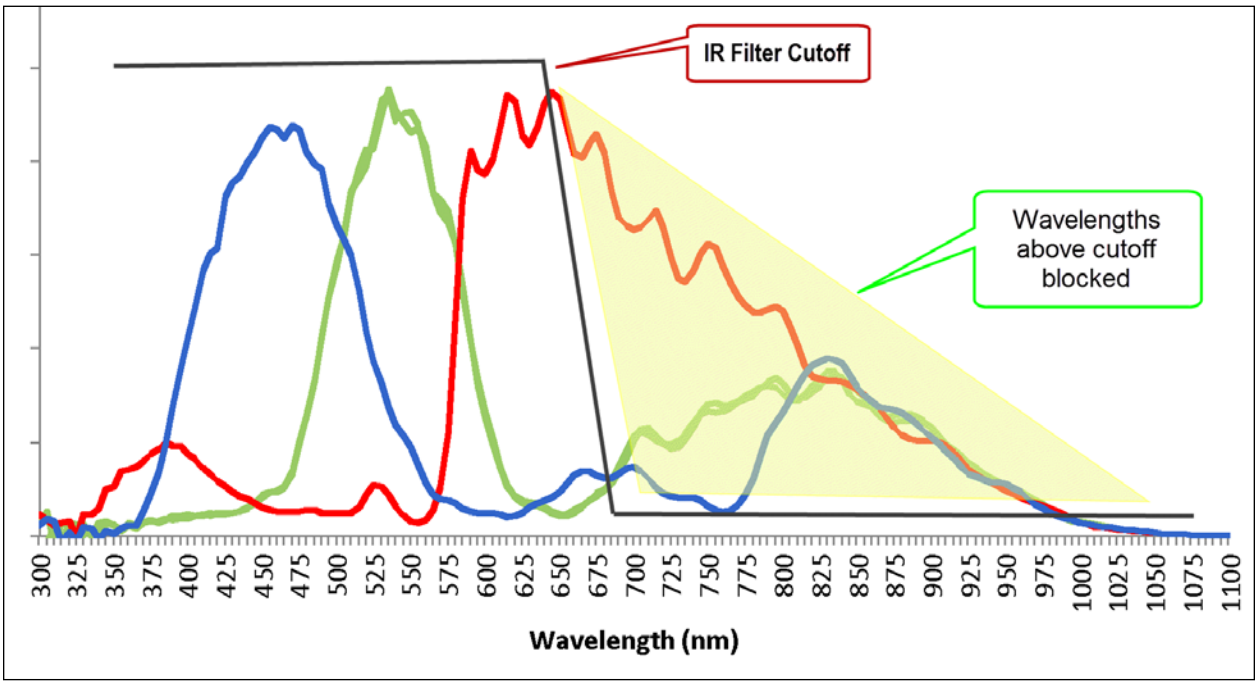
Genie Nano cameras are responsive to near infrared (IR) wavelengths. To prevent infrared from distorting the color balance of visible light acquisitions, use a “hot mirror” or IR cut-off filter that transmits visible wavelengths but does not transmit near infrared wavelengths and above.

All models of Genie Nano color cameras have a spectral response that extends into near IR wavelengths (as defined for each sensor model in the sensor specification descriptions). Images captured will have washed out color if the sensor response is not limited to the visible light band.

The following graphics shows the transmission response of typical filters designed for CMOS sensor cameras. When selecting an IR cut-off filter, choose a near infrared blocking specification of ~650nm. Filters that block at 700nm or longer wavelengths, designed for CCD cameras, are not recommended for Genie Nano color cameras.



The graphic below shows a sample response of a color camera with an overlay of a cut-off filter suppressing wavelengths above 650nm from reaching the camera sensor.

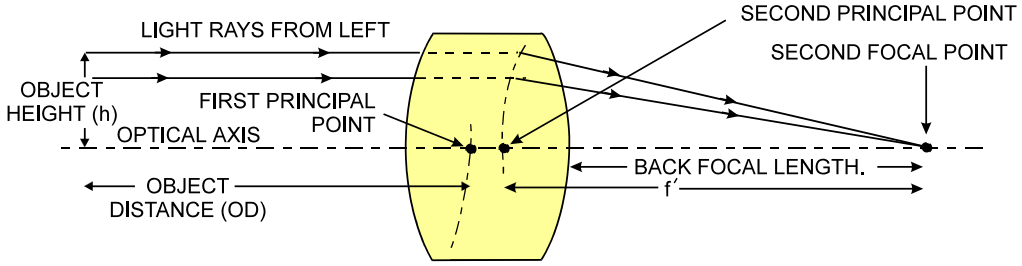


Lens Modeling

Any lens surrounded by air can be modeled for camera purposes using three primary points: the first and second principal points and the second focal point. The primary points for a lens should be available from the lens data sheet or from the lens manufacturer. Primed quantities denote characteristics of the image side of the lens. That is, h is the object height and h′ is the image height.

The focal point is the point at which the image of an infinitely distant object is brought to focus. The effective focal length (f′) is the distance from the second principal point to the second focal point. The back focal length (BFL) is the distance from the image side of the lens surface to the second focal point. The object distance (OD) is the distance from the first principal point to the object.

Primary Points in a Lens System



Magnification and Resolution

The magnification of a lens is the ratio of the image size to the object size:

$m = \frac{h'}{h}$	Where m is the magnification, h' is the image height (pixel size) and h is the object height (desired object resolution size).

By similar triangles, the magnification is alternatively given by:

$m = \frac{f'}{OD}$

These equations can be combined to give their most useful form:

$\frac{h'}{h} = \frac{f'}{OD}$	This is the governing equation for many object and image plane parameters.

Example: An acquisition system has a 512 x 512 element, 10□m pixel pitch area scan camera, a lens with an effective focal length of 45mm, and requires that 100μm in the object space correspond to each pixel in the image sensor. Using the preceding equation, the object distance must be 450mm (0.450m).

$\frac{10\mu m}{100\mu m} = \frac{45mm}{OD}$	$OD = 450mm(0.450m)$

Sensor Handling Instructions

This section reviews proper procedures for handling, cleaning, or storing the Genie Nano camera. Specifically the Genie Nano sensor needs to be kept clean and away from static discharge to maintain design performance.

Electrostatic Discharge and the Sensor

Cameras sensors containing integrated electronics are susceptible to damage from electrostatic discharge (ESD).

Electrostatic charge introduced to the sensor window surface can induce charge buildup on the underside of the window that cannot be readily dissipated by the dry nitrogen gas in the sensor package cavity. With charge buildup, problems such as higher image lag or a highly non-uniform response may occur. The charge normally dissipates within 24 hours and the sensor returns to normal operation.

	**Important**: Charge buildup will affect the camera's flat-field correction calibration. To avoid an erroneous calibration, ensure that you perform flat-field correction only after a charge buildup has dissipated over 24 hours.

Protecting Against Dust, Oil and Scratches

The sensor window is part of the optical path and should be handled like other optical components, with extreme care.

Dust can obscure pixels, producing dark patches on the sensor response. Dust is most visible when the illumination is collimated. The dark patches shift position as the angle of illumination changes. Dust is normally not visible when the sensor is positioned at the exit port of an integrating sphere, where the illumination is diffuse.

Dust can normally be removed by blowing the window surface using a compressed air blower, unless the dust particles are being held by an electrostatic charge, in which case either an ionized air blower or wet cleaning is necessary.

Oil is usually introduced during handling. Touching the surface of the window barehanded will leave oily residues. Using rubber finger cots and rubber gloves can prevent oil contamination. However, the friction between the rubber and the window may produce electrostatic charge that may damage the sensor.

Scratches can be caused by improper handling, cleaning or storage of the camera. When handling or storing the Nano camera without a lens, always install the C-mount protective cap. Scratches diffract incident illumination. When exposed to uniform illumination, a sensor with a scratched window will normally have brighter pixels adjacent to darker pixels. The location of these pixels changes with the angle of illumination.

Cleaning the Sensor Window

Even with careful handling, the sensor window may need cleaning. The following steps describe various cleaning techniques to clean minor dust particles to accidental finger touches.

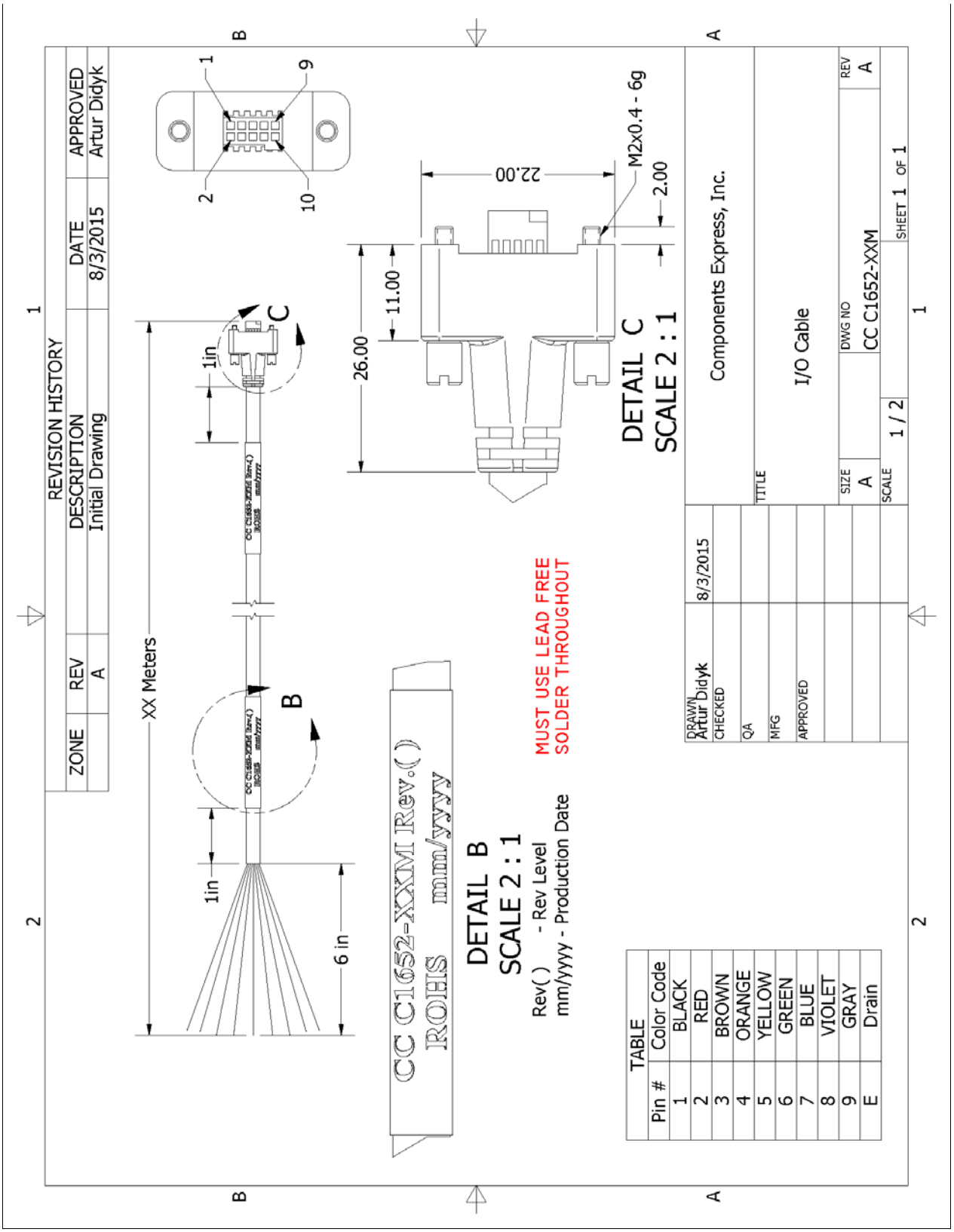
- Use compressed air to blow off loose particles. This step alone is usually sufficient to clean the sensor window. Avoid moving or shaking the compressed air container and use short bursts of air while moving the camera in the air stream. Agitating the container will cause condensation to form in the air stream. Long air bursts will chill the sensor window causing more condensation. Condensation, even when left to dry naturally, will deposit more particles on the sensor.
- When compressed air cannot clean the sensor, Teledyne DALSA recommends using lint-free ESD-safe cloth wipers that do not contain particles that can scratch the window. The Anticon Gold 9”x 9” wiper made by Milliken is both ESD safe and suitable for class 100 environments. Another ESD acceptable wiper is the TX4025 from Texwipe.
- An alternative to ESD-safe cloth wipers is Transplex swabs that have desirable ESD properties. There are several varieties available from Texwipe. Do not use regular cotton swabs, since these can introduce static charge to the window surface.
- Wipe the window carefully and slowly when using these products.

Ruggedized Cable Accessories

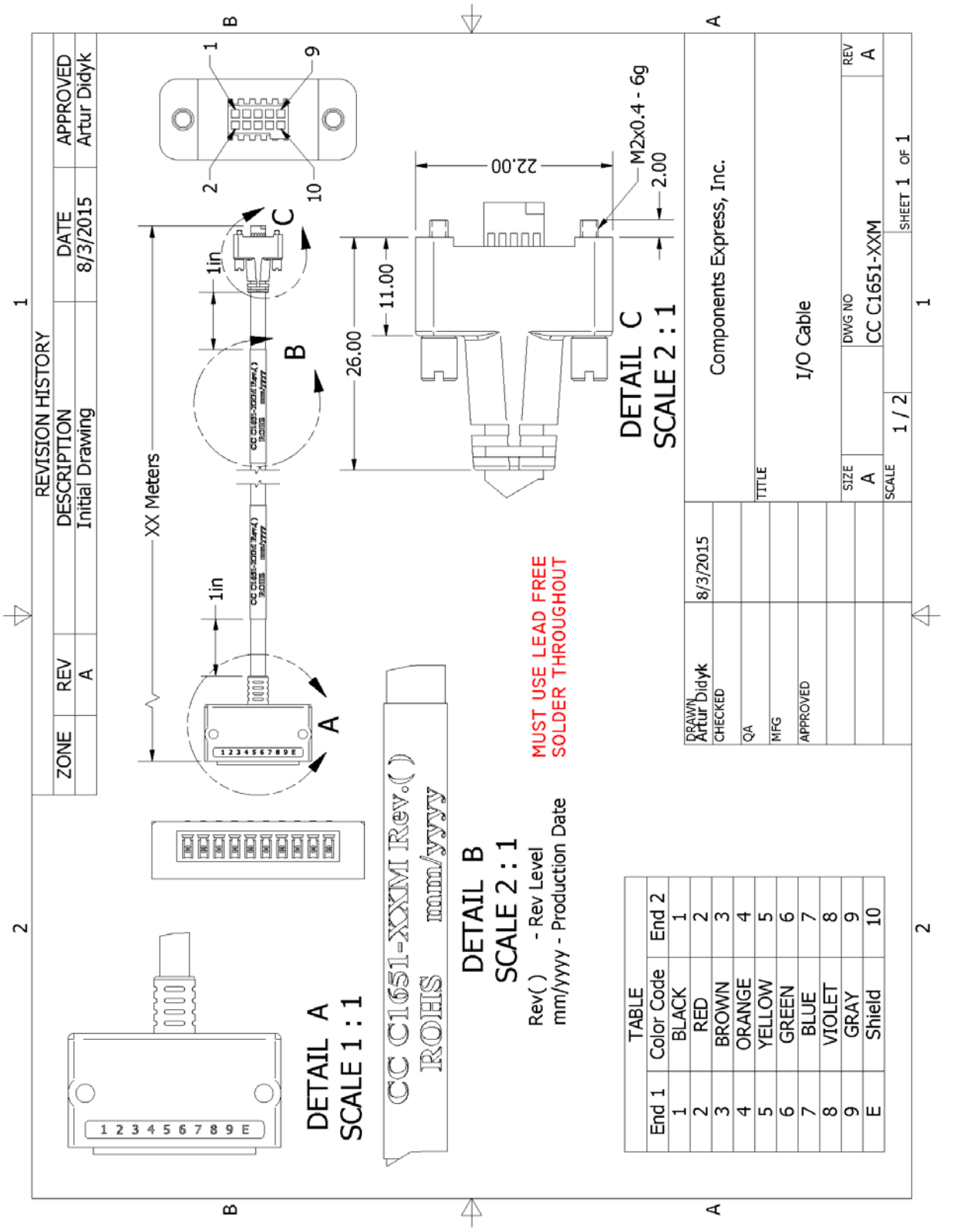
Teledyne DALSA provides optional I/O cable assemblies for Genie Nano. Users wishing to build their I/O cabling by starting from available cable packages should consider these popular assemblies described below. Contact Sales for pricing and delivery.

Users also may order cable assembly quantities directly from Components Express. In such cases use the manufacturer’s part number shown on the cable assembly engineering drawing.

Cable Assembly G3-AIOC-BLUNT2M



Cable Assembly G3-AIOC-BRKOUT2M



Ruggedized RJ45 Ethernet Cables

Components Express Inc. has available industrial RJ45 CAT6 cables that on one end have a molded shroud assembly with top/bottom thumbscrews, while the other end is a standard RJ45 (one example shown below). These cables are recommended when Nano is installed in a high vibration environment. All Nano versions support this secure Ethernet cable. Review their catalog for all available versions of vertical thumbscrew RJ45 cable sets.

RJ45 Vertical
w/Thumbscrews

All cables made in U.S.A. – all cables RoHS compliant.	CAT6 certified (tested for near end / far end crosstalk and return loss). IGE-3M (3meters) IGE-10M (10meters) IGE-25M (25meters) IGE-50M (50meters) IGE-100M (100meters)

Components Express Cable Assemblies

For Information contact:	Components Express, Inc. (CEI) 10330 Argonne Woods Drive, Suite 100 Woodridge, IL 60517-4995 Phone: 630-257-0605 / 800.578.6695 (outside Illinois) Fax: 630-257-0603 http://www.componentsexpress.com/

Troubleshooting

Overview

In rare cases an installation may fail or there are problems in controlling and using the Nano camera. This section highlights issues or conditions which may cause installation problems and additionally provides information on computers and network adapters which have caused problems with Nano. Emphasis is on the user to perform diagnostics with the tools provided and methods are described to correct the problem.

The GigE Server status provides visual information on possible Nano problems. The three states are shown in the following table. Descriptions of possible conditions causing an installation or operational problem follow. Note that even a Nano installation with no networking issue may still require optimization to perform to specification.

	Device Not Available	**Device IP Error**	**Device Available**
GigE Server Tray Icon:			
Note: It will take a few seconds for the GigE Server to refresh its state after any change.	A red X will remain over the GigE server tray icon when the Nano device is not found. This indicates a network issue where there is no communication with Nano. ***Or in the simplest case*,** the Nano is not connected.	The GigE server tray icon shows a warning when a device is connected but there is some type of IP error.	The GigE server tray icon when the Nano device is found. The Nano has obtained an IP address and there are no network issues. Optimization may still be required to maximize performance.

Problem Type Summary

Nano problems are either installation types where the Nano is not found on the network or setup errors where the Nano device is found but not controllable. Additionally a Nano may be properly installed but network optimization is required for maximum performance. The following links jump to various topics in this troubleshooting section.

 **Device Not Available**

A red X over the GigE server tray icon indicates that the Nano device is not found. This indicates either a major camera fault or condition such as disconnected power, or a network issue where there is no communication.

- Review the section Using Nano to verify required installation steps.
- Refer to the Teledyne DALSA Network Imaging manual to review networking details.
- In multiple NIC systems where the NIC for the Nano is using LLA mode, ensure that no other NIC is in or switches to LLA mode. It is preferable that the Teledyne DALSA DHCP

server is enabled on the NIC used with the Nano instead of using LLA mode, which prevents errors associated with multiple NIC ports.

- Verify that your NIC is running the latest driver available from the manufacturer.

Device IP Error

The GigE server tray icon shows a warning with IP errors. Review the following topics on network IP problems to identify and correct the condition.

Please refer to the Teledyne DALSA Network Imaging Package manual for information on the Teledyne DALSA Network Configuration tool and network optimization foe GigE Vision cameras and devices.

Multiple Camera Issues

- When using multiple cameras with a computer with multiple NIC ports, confirm each Nano has been assigned an IP address by checking the GigE server.
- To reduce network traffic in configured problem free systems, use the Network Configuration tool to stop camera discovery broadcasts. Refer to the Teledyne DALSA Network Imaging manual.
- When using multiple cameras connected to an VLAN Ethernet switch, confirm that all cameras are on the same subnet setup on that switch. See the Teledyne DALSA Network Imaging package manual for more information. .
- If a Nano camera installed with other GigE Vision cameras cannot connect properly with the NIC or has acquisition timeout errors, there may be a conflict with the third party camera's filter driver. In some cases third party filter drivers modify the NIC properties such that the Teledyne DALSA Sapera Network Imaging Driver does not install. Verify such a case by uninstalling the third party driver and installing the Nano package again.
- Verify that your NIC is running the latest driver available from the manufacturer.

Device Available but with Operational Issues

A properly installed Nano with no network issues may still not perform optimally. Operational issues concerning cabling, Ethernet switches, multiple cameras, and camera exposure are discussed in the following sections:

Always Important

- Why should Nano firmware be updated? See Firmware Updates.
- Power Failure During a Firmware Update–Now What?
- Cabling and Communication Issues
- See Preventing Operational Faults due to ESD to avoid random packet loss, random camera resets, and random loss of Ethernet connections.

No Timeout messages

- I can use CamExpert to grab (with no error message) but there is no image (display window stays black). See Acquisition Error without Timeout Messages.
- I can use CamExpert to grab (with no error message) but the frame rate is lower than expected. See Camera acquisition is good but frame rate is lower than expected.
- There is no image and the frame rate is lower than expected.
  See Camera is functional but frame rate is lower than expected.

- There is no image but the frame rate is as expected.
  See Camera is functional, frame rate is as expected, but image is black.

Other problems

- Unexpected 'Trigger Events'. See Random Invalid Trigger Events.

Verifying Network Parameters

Teledyne DALSA provides the Network Configuration tool to verify and configure network devices and the Nano network parameters. See section Network Configuration Tool of the Teledyne DALSA Network Imaging manual, if there were any problems with the automatic Nano software installation.

Before Contacting Technical Support

Carefully review the issues described in this Troubleshooting section. To aid Teledyne DALSA personnel when support is required, the following should be included with the request for support.

- From the Start menu, go to **Programs • Dalsa • Sapera LT • Tools** and run the **Log Viewer** program. From its File menu click on **Save Messages** to generate a log text file.
- Report the version of Genie Nano Framework and Sapera version used.

Device Available with Operational Issues

This section considers issues with cabling, Ethernet switches, multiple cameras, and camera exposure. All information concerning the Teledyne DALSA Network Configuration Tool and other networking considerations, is available in the **Teledyne DALSA Network Imaging manual**.

Firmware Updates

As a general rule any Nano installation must include the firmware update procedure (see File Access Control Category). Nano camera firmware that does not match a newer version of installed Nano Framework software is likely to have unpredictable behavior.

Problems might be:

- Nano is not found by the device discovery process.
- Nano is found by the Sapera GigE Server but an application such as CamExpert does not see the camera.
- A Nano that had a fault with a firmware update will automatically recover by booting with the previous firmware version.

	**Important**: New Nano cameras installed in previously deployed systems are fully backward compatible with the older vision application.

Power Failure During a Firmware Update–Now What?

Don't panic! There is far greater chance that the host computer OS is damaged during a power failure than any permanent problems with the Nano. When electrical power returns and the host computer system has started, follow this procedure.

- Connect power to the Nano. The Nano processor knows that the firmware update failed.
- The Genie Nano will boot with the previous version of firmware and will operate normally.
- Perform the firmware update procedure (see File Access Control Category) again.

Cabling and Communication Issues

With only two cables connected to Nano, possible cabling issues are limited.

Power supply problems:

- If the Nano status LED is off, the DC supply power is not connected or faulty. Verify the power supply voltage.

Communication Problems:

- Use a shielded cable where the connector shell electrically connects the Nano chassis to the power supply earth ground. This can eliminate trigger issues in a high EMI environment.
- Check that the Ethernet cable is clipped both to the Nano and the NIC or switch on the other end.
- Verify the Ethernet cabling. Poor cables will cause connections to auto-configure at lower speeds.
- Use a secured Ethernet cable when the Nano is in a high vibration environment. See Ruggedized RJ45 Ethernet Cables.
- Check the Ethernet status LEDs on the NIC used with the camera. The Link Status indicator is on and the activity LED should flash with network messages.
- Verify that the Ethernet cable is CAT5e or CAT6. This is very important with long cable lengths.
- When using very long cables, up to the maximum specified length of 100m for gigabit Ethernet, different NIC hardware and EMI conditions can affect the quality of transmission.
- Minimum recommended Ethernet cable length is 3 feet (1 meter).
- Use the Log Viewer tool (see point below) to check on packet resend conditions.
- Run the Sapera Log Viewer: **Start•Programs•Teledyne DALSA•Sapera LT•Tools•Log Viewer**. Start the Nano acquisition program, such as CamExpert. There should not be any "packet resend" messages, else this indicates a control or video transmission problem due to poor connections or extremely high EMI environments.

Acquisition Error without Timeout Messages

Streaming video problems range from total loss of image data to occasional loss of random video data packets. The following section describes conditions identified by Teledyne DALSA engineering while working with Nano in various computers and setups. See the Teledyne DALSA Network Imaging manual for information on network optimizations.

No camera exposure when expected

- Verify by using the camera in free-running mode. Do not use external trigger mode when testing a camera setup.
- If using free-running mode, verify that the exposure period is set to the maximum possible for the set frame rate.
- Load factory default from the Power-up Configuration in CamExpert. This will reset the camera to its nominal acquisition rate.

Camera is functional but frame rate is lower than expected

- Verify Ethernet link speed. If the LAN connection is limited to 100 Mbps, the Genie Nano frame rate maximum will be limited once the internal buffers are filled. See the Teledyne DALSA Network Imaging manual for information on network optimizations.
- If using an external trigger, verify the trigger source rate and Nano parameters such as trigger to exposure delay.

Camera acquisition is good but frame rate is lower than expected

- While running CamExpert and grabbing in free-run mode at the maximum frame rate, start the **Sapera Monitor** tool from the Sapera Tools installed with Sapera.
- Make sure the **Memory Overflow** event monitor is enabled.
- Continue grabbing from the Nano at maximum frame rate. If any memory overflow events are counted, then the Nano internal buffer could not be transmitted on time and was discarded. Such a condition may occur with large frame color or high frame rate Nano cameras.
- Note that the Sapera CamExpert tool has limits to the maximum frame rate possible due to CamExpert generating an interrupt for each acquired frame. The Sapera Grab Demo may be better suited for testing at higher frame rates.
- Verify that network parameters are optimal as described in the Teledyne DALSA Network Imaging Module manual. Ensure the host computer is not executing other network intensive tasks. Try a different Gigabit NIC.
- Note that a changed acquisition frame rate becomes active only when the acquisition is stopped and then restarted.

Camera is functional, frame rate is as expected, but image is black

- Verify that the lens iris is open.
- Aim the Nano at a bright light source.
- Check that the programmed exposure duration is not too short or set it to maximum. See Sensor Control Category.
- Using CamExpert set the Nano to output its Internal Pattern Generator. This step is typically done for any camera installation to quickly verify the Nano and its software package. See Internal Test Pattern Generator for information on using CamExpert to select internal patterns from Nano.

Other Problems or Issues

This section describes problems that do not fit any of the categories above. Typically these are issues found in the field under specific or unusual conditions.

Random Invalid Trigger Events

Do not change the exposure time while grabbing, else an Invalid Trigger Event may be generated. This applies to any exposure mode or trigger source. The Invalid Trigger Event is not catastrophic and only indicates the loss of a video frame. Stopping acquisitions first will avoid this error.

Minimum Sapera Version Required

Save User Configuration Failed: An unusual error that occurred with no other Nano control problem. The solution is to verify the minimum Sapera version used with the Nano Framework. The Genie Nano requires Sapera version 8.00 or later.

Issues with Cognex VisionPro

When the Cognex VisionPro package is uninstalled, the Genie Nano becomes not available within CamExpert due to the Cognex uninstaller removing GigE Vision components. This forces a Genie Nano user to reinstall the framework package.

Cognex VisionPro remains a useable third party product except for their uninstaller fault. Genie Nano users just need to account for this issue until resolved by Cognex.

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